Tactile communication across the first year of life – the complexity of naturalistic dyadic patterns and the effects of contextual, age and affectual factors.

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“At the touch of love everyone becomes a poet”

Plato

“In rivers, the water that you touch is the last of what has passed and the first of which is to come; so with present time”

Leonardo da Vinci

“Its easy to play any musical instrument: all you have to do is touch the right key at the right time and the instrument will play itself”

Johann Sebastian Bach

“To be able to feel the lightest touch is really a gift”

Christopher Reeve

“If you touch me you’ll understand what happiness is; Look a new day has begun”

Trevor Nunn based on a poem by T.S Eliot

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ABSTRACT

Tactile communication across the first year of life – the complexity of naturalistic dyadic patterns and the effects of contextual, age and affectual factors.

Early intimate interactions between mothers and their infants are characterized by mutual and reciprocity. Bidirectional influences of mother and infant variables intersect in mutually negotiated moments of connection. A complex array of communicative modalities are expressed uniquely in real-time (second-by-second) and in developmental time (week-by-week, month-by-month). An often-neglected feature of this array – tactile communication – was explored in this dissertation to examine contextual and developmental effects of the use of touch in early social interactions.

Naturalistic interactions between mothers and their full term infants (n = 32), were videotaped in their own homes at five age points across the first year – 6weeks, 3, 6, 9 and 12 months. A contextual variation was introduced at 6, 9 and 12 months by providing a selection of novel toys for the dyads to play with. Each second of a selected 5 minute period of interaction of both the free play and toy play contexts, was coded using a coding schedule for the type of touch, location of touch, intensity of touch, gaze direction and affectual displays.

Repeated measures analyses of variance were conducted which revealed differences in the duration and locations of touch, and changes in maternal and infant affect and gaze across the first year.

Patterns in these non-verbal communicative strategies were shaped by both age and context. Changes in how these behaviors were organized at each age point are highlighted.

Results revealed that overall maternal touch decreased over the first year and that mothers used more passive forms of touch than more active forms when interacting with their infants. The duration of gaze at face decreased for both the mothers and infants over time, while gaze at object and body increased. Taken together these findings confirm a change from proximal to distal behaviors over time.

Infant initiated touch was both low in frequency and duration but showed commonalities across dyads.

These results are discussed drawing on insights from ethology, attachment theory, systems theory and the complexity of the multimodal features of interactive exchange. The thesis is the first study to examine touch in naturalistic interactions across five time points in the first year, and contributes to the understanding of how vital touch is in dyadic interactions. The results underscore the implications for tactile stimulation in early patterns of communication.

CHAPTER ONE: INTRODUCTION

Overview

Complex dynamic processes enveloped in intimacy characterize the early months of human life. From the earliest moments infants are participants in reciprocal exchanges with others and there is agreement across theoretical frameworks that "intimate one-to-one relationships are the cradle of understanding" (Rochat & Striano, 1999). Implicit in these social exchanges is an infant that is both active and reactive with significant others – usually the mother in research – and an emphasis on the communication patterns of these early shared experiences. With origins in utero the infant's ability to develop patterns of communication and social and emotional connectedness with a primary caregiver relies as much on the contributions of the infant as the capability of the caregiver to generate a successful interactive environment. Indeed primary caregivers are the infant's environment, at least in the early weeks of life. This is supported by evidence that most infants arrive as provocative participants being able to vary their cry patterns and limb activity to communicate need (Fogel, 1992), and that by about the second month of life the complexity of their communication strategies is bound in "protoconversations" (Rochat, Querido & Striano, 1999) which attest to the infants responsivity.

Of significance is the shift in understanding to an almost universal acceptance that social exchanges between adults and infants are *bidirectional* in nature (Murray & Trevarthen, 1990) and as such the mutual effects of one with the other take centre stage. Gone is the long held view that mothers (primary caregivers) are responsible for socializing a passive, vulnerable and helpless infant. Indeed researchers across disciplines have offered a plethora of terms that have become almost interchangeable

and somewhat conflated with regards to adult-infant relationships – 'attunement', 'dialogue', 'coordination', 'synchrony' (Hsu & Fogel, 2003, p 1062).

However, individually they fall short of explaining the lived experience of the dyad in part, as some commentators argue, because of the "anthropological reality of community" (LaMothe, 2006, p455). Acknowledging the "web of human relations" (LaMothe, 2006, p455) that adult-infant dyads experience within communities supports a constructivist view that personhood, or how to relate, is rooted in early experiences that validate the wider cultural tenets of how to relate. Certainly dyadic patterns appear too simplistic and untenable given the existential goals in this regard.

The metaphor of concentric circles, marries well the notion of the web of human relations. Bronfenbrenner's seminal writing (Bronfenbrenner & Ceci, 1994) and his bioecological model, reinforces the role of community by cleverly offering a nested systems model of influence in early development. This model outlines the complex path from genotype to phenotype stressing the interaction between an active infant and environmental influences. Critically, success is achieved through *proximal processes* - "enduring forms of interaction in the immediate environment" (Bronfenbrenner & Ceci, 1994, p572), and can be found in "parent-child activities". By emphasizing the inseparability of an active human intersecting with active environmental forces, these authors are clear that one influences the other. An infant's development becomes as much about its own potentialities to influence the environment, as the now changed environment from this interaction in turn exerts influence over the infant.

This is consonant with the notion that an adult-infant dyad is a mutually regulated system (Cohn & Tronick, 1988), and similarly acknowledges bidirectional influence

while stressing an examination of both ends of the bidirectional arrow. Maternal influences on a child's development are one end of the arrow – infant influences the other. The dyad is part of an immediate environment termed the "microsystem" (Bronfenbrenner, 1979), which is embedded in wider environmental portals encompassing culture and society.

It seems reasonable to assert in light of this that with maturation the infant is more likely to become a more competent partner in social exchanges. From a dynamic systems perspective developmental progress in any area including physical, intellectual or emotional is a result of the persistent interplay between an infant's maturing body, neurobiological changes and external environmental factors (Thelen & Smith, 1998). This resonates with the bioecological model advancing the role of both environmental and organismic factors (Bronfenbrenner, 1979).

Thus consistent references to critical environments as influential mechanisms on human development, the precociousness of young infants, and the reciprocal and mutual influences during adult-infant intimate exchanges, has opened the door on an extensive range of phenomena seeking to explain the intricacies of such exchanges that act as the foundation for the social emotional development of the child (Brazelton, Koslowski, & Main, 1974).

The infancy literature exploring both the *content* and *quality* of behavioural expressions of face-to-face interactions between parents (hereafter called mothers to reflect the bias in the research and for clarity given that "primary caregiver" is the intended definition), and their infants is extensive. Sparked by interest in the communicative concomitants of dyads and outcomes for the child, this field has seen consistent references to facial, gaze and vocal expressivity of mothers during one-to-

one exchanges. These encompass both attentional and affective domains assessable by a range of contemporary methodologies.

In addition infant gaze, visual attention, vocalizations and cry/fuss/smiling behaviors are now valued for their ability to index young infant's attempts to coordinate responses and signal social alertness. More specifically these behaviours are said to index vital communicative functions including gender differences in synchronous patterns (Cohn & Tronick, 1989), the emergence of social competence in infants as young as 2 months (Spitz & Wolf, 1946), shared attention to an object (Bakeman & Adamson, 1984), the alternation of switch pausing mimicking conversational turns (Bateson, 1975; Jasnow & Feldstein, 1986), infant preference for the mothers voice (De Casper & Fifer, 1980), coordination of mother's and infants behaviour across modalities (Feldman, 2007), rhythmic organization within dyadic interactions (Jaffe, Beebe, Feldstein, Crown, Jasnow, 2001), and dyadic attunement (Stern, 1985).

Recently researchers have challenged this reduction of dynamic processes to isolated contributions of each individual to confront how these patterns evolve in real time so that the mutuality of unique relational experiences can be synthesized (Fogel & Garvey, 2007, Hsu & Fogel, 2003). This focuses attention on how novelty and expectation fuels what has been termed the "relational communication system" (Fogel & Garvey, 2007). Here interactions that are continuously modified by sequences of actions and co-actions and feedback to both the mother and the infant information about the relationship. A game of "tickle" is a good example of how these sequences unfold over time. The mother may initiate the game, lunge before physical contact, alter her facial expression, change her posture and open her mouth and eyes widely. The infant's response to this may be a smile, arm and leg movements and vocalizations that in turn, triggers a tickle response from the mother, simultaneous

laughter and body contorting by the infant. Laughter from the mother followed by a kiss on the infant's cheek may signal the end of that particular sequence. Such a complex sequence underscores the constant adjustments that are made from one partner to another, as response patterns assembled in real time prove mutually influential.

Gaze, affect and facial expressivity, smiling and vocalizing, crying and pointing have been referred to as distal behaviours (Moszkowski, Stack, Girouard, Field, Hernandez-Reif & Diego, 2009; Moszkowski, Stack & Chiarella, 2009; Moszkowski & Stack 2007), and are typically studied as discrete behaviours as part of these "patterns of signals and responses among individuals (Evans & Porter, 2009).

Extensive data examining infant-mother face-to-face interactions, indicate that from within the intimacy of these relationships, are woven patterns of regulated emotional expressivity and response patterns (Brazelton & Yogman, 1986; Stern, 1985; Walden & Ogan 1989). These and other authors indicate that as infants mature they develop the ability to search for meaning in another's emotional expressions. The study of early mutual play behaviours in dyads suggests that infants are able to construct meaning from the world through various expressive displays (Lyons_Ruth & Zeanah, 1993). It has been found that mothers respond differentially to negative and positive expressions of their infants (Huebner & Izard, 1988), that infants of depressed mothers display "depressed" facial expressions (Lundy, Field, & Pickens, 1996) and that there are gender differences in negative and positive emotional displays that are mediated by the Still-Face procedure (Weinberg, Tronick, Cohn & Olson, 1999).

In contrast, proximal behaviours have received far less attention - the most notable example being the modality of touch. Given the ubiquitous presence of touch in the

communication patterns of all primates, both human and non-human (Hertenstein, 2001), this is both surprising and glaring. Some commentators have posited that this is largely due to the embeddedness of touch within other sensory channels of communication (Barnard & Brazelton, 1990), and the primacy afforded gaze and affect in the regulation of social stimuli (Cappella, 1981). Certainly there is abundant evidence for the mobilization of a range of expressive behaviours indicating the naturalness on the part of the mother to maximize communicative contact (Stack, 2001). Yet it has been shown that mothers touch their infant's as part of normally occurring face-to-face engagements, over 65% of the time (Stack & Muir, 1990). This frequency accentuates the importance of touch. Indeed some researchers attest to the phylogenetic and ontogenetic dominance of touch and other non-verbal sources of communication as precursors to language development (Burgoon, Buller, & Woodall, 1996, cited in Hertenstein, 2006). Further support for this claim is found in growing evidence that from conception the tactile system develops earlier than other sensory systems (Montagu, 1971), with a further suggestion that it is first in the order of sensorial development (Gottlieb, 1983). These claims would indicate that the newborn arrives well equipped to process tactile information from the environment, and that both the communicative functions and quality of touch are central to understanding early patterns of interactive displays.

In highlighting dearth of research into touch, for clarity it is important to distinguish a body of literature that has developed around the socio-physiological benefits of massage and the use of therapeutic touch (Field, 2002). Evidence in this field relates directly to the differential effects various types of maternal touch e.g. stroking, kissing, pinching, tickling on infant behaviour (Pelaez-Nogueras, Field, Hossain, & Pickens, 1996a), and infant preferences for different intensities of touch patterns

(Hiselgis, Gerwitz & Field, 2001, cited in Field, 2002). Authors note the benefits of massage and touch therapies that include more eye contact, smiling and vocalizations as a result of a structured stroking program (Pelaez-Nogeras, Field, Gerwitz, Cigales, Gonzales, Sanchez, & Richardson, 1997), shifts to greater positive affect in infants of depressed mothers as a result of maternal touch stimulation (Pelaez- Nogeras et al 1996a), and the soothing and tension reducing effects of massage on preterm infants (Hernandez-Reif, Diego & Field, 2007). Mothers were used in an earlier study on the effects of the Still-Face procedure (Tronick, Als, & Brazelton, 1980), and it was found that attention in 3-month olds was mediated by maternal touch (Gusella, Muir & Tronick, 1988). Relatedly, one study documented how father-infant interactions were improved by regular massage (Cullen, Field, Escalona & Hartshorn, 2000). The beneficial effect of therapeutic touch and massage is equivocal, but the degree of difference between using the mother (or father) in the therapeutic intervention or an experimenter (as in most cases) is under-researched. Within a bidirectional frame of reference positive interpersonal effects of touch therapy while speculative are likely.

Certainly this fact is overlooked in a recent and comprehensive review of the "communicative functions of touch" (Hertenstein, Verkamp, Kerestes, & Holmes, 2006). While accepting the limitations placed on the review, recent data (Cullen et al, 2000; Hernandez-Reif et al, 2007), at the very least posit therapeutic touch/massage and stimulatory touch as critical contributors to our understanding of the complexity of the tactile modality within relationships. This notion is supported by researchers who espouse the multifunctionality of touch:

> "Touch is used frequently in the first year of life and it serves a multitude of purposes, ranging from maintaining infant's state, to increasing weight gain and caloric intake in preterm infants, to providing

> comfort and warmth, to providing a means of social communication, to adjusting posture, to serving an important means of developing the early parent-child relationship, among other roles" (Stack, 2001, p 368).

This references touch as a modality that crosses functional boundaries and the author goes on to further stress the interpersonal qualities by adding:

> "…the tactile modality provides an important means for parents and infants to maintain a connection with each other as well as to the environment and to the self " (Stack, 2001, p368).

This resonates with the theoretical models outlined earlier with clear emphasis on the interconnectedness of environmental and interpersonal factors. Just as salient is what tactile expressivity brings to a developing communication system that is mutually regulated. Certainly this suggests an "adaptability of the communication system" (Stack, 2001, p368), and furthermore highlights touch as a modality for adjusting, adding, initiating and transforming and sharing social, emotional and cognitive information.

Questions central to these tenets include: what is communicated through touch and how does this develop over time? Some authors favour a functionalist approach to exploring the role of tactile communication in infant development that focuses less on the assignation of meaning to particular touch observations, but rather emphasizes the utilization of touch and the outcomes for the interactants (Hertenstein et al, 2006). Advocating this approach supports the notion of spontaneity in interactions because it suggests that responsive communicative behaviour is marshaled in an "online"

fashion i.e. is not always planned or goal directed. Moreover, context becomes crucial – both internal and external – as one considers how touch is embedded in a communicative array - an array that can value the covariance of expressive displays, in varied environments.

The latter point is crucial to the present research that directly examines the occurrence and regulation of communicative touch patterns present in natural settings. Specifically this meant the investigation of quantitative and qualitative aspects of touch behaviour in both the infant and the mother, in combination with affect and gaze behaviour across the first year of life. While the distal behaviours, particularly of the mother, are well documented in the literature, less is known of how touch is used by infants during communication particularly longitudinally (Hertenstein, 2002; Hertenstein, 2006; Stack, 2001).

Further, information on the integration of particular types of distal and proximal modalities of communication during naturalistic and perturbed interactions is sparse (Jean, Stack, & Fogel, 2009; Moszkowski, Stack, & Chiarella, 2009), particularly documenting the type and valence of touch patterns to contribute to the development of a "tactile lexicon" for an understanding of the "development of infant productive vocabulary" (Muir, 2002, p99).

In order to integrate the present study into a body of salient literature, several theoretical paradigms will be discussed and central theses outlined. Of import is the historical background to the work, and the positing of intimate touch patterns within a relational frame of reference.

Crucially it was the intention of the present investigation to contribute to the understanding of the communicative functions of touch and by tackling shortcomings in the literature. Specifically this meant using microanalytic methods to explore the development of infant touch patterns over the first year of life, investigate how touch is embedded in an array of expressive behaviours that communicate meaning and connectedness with another, and provide longitudinal data relating to change and stability of touch patterns for dyads over time.

Face-to-face interactions between mothers and their infants, and the attendant behaviours, have long been the cornerstone of explorations into social emotional regulation and communicative development (Cohn & Tronick, 1988). They are said to provide the backdrop for later social, emotional, cognitive and language competencies (Brazelton, Koslowksi & Main, 1974). Other studies employ confederates or researchers in the course of examining interactive patterns of infants and are of little relevance to the present study and will not be reviewed at length.

In an effort to provide a more holistic perspective of the communicative elements of touch in relationships, touch in the current study is examined with the expectation that co-occurring contextual factors will create "environmental tension" i.e. a climate of responsive demand, that will result in the assemblage of a range of responsive patterns. As some commentators have suggested, touch should not be explored in isolation (Hertenstein, 2006), but rather with full cognizance of the ecological context (Bronfenbrenner, 1979).

It is important to acknowledge that while data regarding fathers and infants is a burgeoning area with regard to touch and recent research has indicated the importance of father-infant relationships (Cullen, Field, Escalona & Hartshorn,

2000), the bulk of the literature centres around maternal influences on infant development. Availability is undoubtedly the main contributor to this bias and reflective of social practices of rearing children, particularly in the Western world.

Theoretical Foundations of the Significance of Touch

The path to contemporary treatment and understanding of touch in human relationships is littered with significant contributions from authors of varying theoretical persuasions. Despite a long history of attention, it is only recently that the importance of the early writings, have entered empirical endeavours as researchers evaluate the role touch plays as a "foundation for human experience" (Barnard & Brazelton, 1990). This transcends how 'touch serves to make human survival possible" and extends "to make life meaningful" (Barnard & Brazelton, 1990, pii).

Early seminal writings have included reference to a view of the primacy of touch as the modality for a mother to express love and affection for her infant (Darwin, 1872). The elegance of Darwin's writing is worth quoting at length because of the perceptive insights into how touch functions in the realm of mother-infant expressivity.

> "Although the emotion of love, for instance that of a mother for her infant, is one of the strongest of which the mind is capable, it can hardly be said to have any proper or peculiar means of expression; and this is intelligible, as it has not habitually led to any line of action. No doubt, as affection is a pleasurable sensation, it generally causes a gentle smile and some brightening of the eyes. A strong desire to touch the beloved person is commonly felt; and love is expressed by this means more plainly than by

> any other …We probably owe this desire to inherited habit, in association with the nursing and tending of our children and with the mutual caresses of lovers" (Darwin, 1872, p 215).

What is poignant about Darwin's thesis is that it foreshadows what future theorists and empiricists were to espouse over a century later. By referencing the import of affect, gaze, emotional expressivity, sensation, cognition and touch in relational context and relational history, Darwin apprehends the dynamic properties and emerging qualities of the communication process.

Recent theoretical attention to touch echoes Darwin's views, and as will be seen represent a gradual shift from understanding individuals to understanding communicative systems of which individuals are a part.

One of the earliest studies observing infants who had been deprived of maternal stimulation, embedded the tactile modality in a general exploration of communication (Spitz & Wolf, 1940). The authors in discussing the significance of vision and the development of smiling, acknowledge that "there is another sector of the perceptive field which plays an important role during the first trimester. That is the tactile sense…" (Spitz & Wolf, 1940, p110). However they dismiss direct tactile stimulation as the major source of infant security and pleasure and elevate the sense of equilibrium and muscle and joint sensitivity.

However, paradigmatic shifts in the 1950's and 1960's heralded significant changes in not only attempting to discover the unique contribution of touch to infant development, but critically how the infant and infant development was to be characterized. Simultaneous and related but as yet independent threads of inquiry, provided the impetus for change. Most significantly these inquiries, drawing on

psychoanalytic, behavioural, ethological and evolutionary principles concentrate toward themes of the functions of communication repertoires.

In the 1940's and 1950's John Bowlby was accumulating extensive clinical observations of children in institutions and hospitals, with a particular interest in the consequences of maternal deprivation. Experiences with children orphaned and separated from their primary caregivers during wartime, added to his view of how crucial attachment was to later development. This transformed into a theoretical trilogy of *Attachment and Loss* (Bowlby, 1969-1982), to be discussed more fully later in this review.

The 1950's heralded the seminal work of Harry Harlow and his colleagues (Harlow, 1958, Harlow & Zimmerman, 1959). The celebrated studies of these authors explored the effects of maternal surrogacy on infant rhesus macaques (*macaca mulaata)*. Their findings challenged long-held psychoanalytic views on primate behaviour and attachment to mothers and sparked attention to newborn activity and preferential behaviour. Infants were taken from their mothers shortly after birth and were "parented" by two surrogate 'mothers' – one made of cloth and the other wire. Findings showed that the infants spent more time with the cloth 'mother', even when the wire 'mother' provided access to food (Harlow & Harlow, 1962), or if the wire "mother" was heated (Harlow & Suomi, 1970). In addition the researchers reported qualitative differences in the infants behaviour. Not only did they spend more time with the cloth 'mother', they exhibited clinging behaviour on contact to a fear stimulus and used the surrogate cloth "mother" as a "source of security, a base of operations …they would manipulate a stimulus and then return to the mother before adventuring again into the new strange world" (Harlow, 1958, p 679). What is decisive about these findings was that "contact comfort" (Harlow, 1958, p 677), had

primacy over satiation from food which could not be reconciled with hunger and thirst as examples of the primary drives of the unconscious mind so enduring of psychoanalytic thinking.

Importantly, Harlow's experiments are notable for two other reasons salient to the current paper. Firstly, behavioural indexes of emotionality were measured during mother surrogate presence and absence. These included vocalizations, crouching, rocking and sucking, and Harlow (1958) reported that the infant macaques would exhibit "screaming and crying", and "frantic clutching of their bodies" (p 680) in the absence of the cloth 'mother' and the presence of a wire 'mother'. This demonstrates the integration of a rich and varied array of behaviours – touch included – that influence emotional responses and serve as motivators for physical contact. Taken further this suggests a communicative function for this integrated information – it is made explicit and shared. Indeed it is suggested that:

> "In spite of the importance of comfort contact, there is reason to believe that other variables of measureable importance will be discovered….Sounds, particularly natural, maternal sounds, may operate as unlearned or learned affectional variables. Visual responsiveness may be such a variable…"(Harlow, 1958, p 685).

Later related experiments offer support for these claims indicating the importance of tactile contact in normal development of non-human primates in particular ventral to ventral contact as a regulator of stimulation (Suomi, 1990). The impact of peer grooming is also stressed suggesting that tactile contact is critical in the maintenance of the social organization and communication later in life (Ehrlich, 2000; Silk, 2002). These experiments have intrinsic value to their own field, but also generate

comparative interest for those studying human behaviour. Commentators draw similarities between the activation of attachment system in the young of both human and non-human primates due to the infant's separation from the mother (Hertenstein et al, 2006), and the interaction between head size and touch (social grooming) amongst non-human primates as a way of "emphasizing points of similarity and continuity between modern human symbolic language and non-human primate vocalization'"(Aiello & Dunbar, 1993, p 191). Implicit here is the idea that touch is foundational to communication and that pre-language capacities offer a window of ontological significance. That attachment behaviors in both human and non-human primates share points of similarity in relation to tactility – proximity seeking, clinging, crying when physically separated, clutching and stroking – adds support to this claim (Harlow, 1958).

Secondly, stability and change within the mother-child relationship were expected (Harlow, 1958). Indications were that, "we are in a position to assess the effects of feeding and contractual schedules; consistency and inconsistency in the mother surrogates; and early, intermediate and late maternal deprivation" (1958, p 685). These points are salient to human populations and in fact mirror the bulk of research directed at maternal variables and hint at the need for longitudinal research that tracks development over time. These points will be returned to when discussing the rationale for the current research.

At the same time as the first of Harlow's experiments were concluding, a paper was published remonstrating the psychological community for it's lack of attention to the properties of touch in development (Frank, 1957). Eloquent in its treatment of the topic and steeped in object-relations traditions of personality development, there is a clear call to researchers to explore the primacy of tactile communicative functions in

human development. The paper clearly proffers the tactile system as the most primitive mode of reception that develops ahead of other modalities both physiologically and communicatively. Ahead of its time, the paper is littered with references to the mother-infant system. Certainly this is within a signal-response framework, however there is tangible evidence in the writing of the cognizance of the influence of mutual responding. According to this author it important to apprehend:

> "…that *interaction* implies dual *reactions* where two bodies receive impacts from each other and react accordingly…Thus the transactional process involves reciprocal, circular relations like a feed back with the participating persons tuned or prepared for such circular reciprocal communications…This goes beyond the familiar stimulus-response formula of linear relations…in which two persons communicating by their responses to each other evoke reciprocal responses as a dialectual process or as resonance" (Frank, 1957, p215).

The writing goes on to implicate patterned responses as vital in the communicative process;

> "…by evoking from the world what has been established for him as meaningful and significant for the appropriate responses as culturally patterned" (Frank, 1957, p213)

In addition expressive behaviour, basic sensorimotor and biological functions, and individual patterns of development are key to comprehending the complexity of human communication. These points speak to the importance of ecological,

biological, cultural and patterned responses over time as variables impacting the dyad to “establish and maintain continual intercourse with the world” (Frank, 1957, p 214).

Further resonances with the present research can be found in the application of psychoanalytic theory to the study of infant development within the context of family (Winnicott, 1957; 1965; 1971). The much quoted declaration, that “there is no such thing as a baby” (Winnicott, 1947), has endured largely perhaps because it is a truism. Moreover, by implication there can be no such thing as a mother because one defines the other and in a sense the presence of one creates the existence of the other. By stressing the role of the ‘holding environment’ – a metaphor for the intersection of the physical and psychic worlds - the maternal roles of ‘holding’ and handling the infant, as well the contiguous process an infants developing representations of the external and internal world - object relations theory (Fairburn, 1952), was held as crucial to the development of the self. While convinced that an infant was an undifferentiated and non-integrated organism at the beginning of life (Winnicott, 1957), these points highlight the inseparability of the infant and the mother and the vitality of touch. Critically this thrust psychodynamics into a social context.

While a full treatise of object relations theory is outside the scope of this paper, without reducing its integrity it is important to highlight the suggested roles that repeated patterns of experience, both subjective and objective play in charting the life journey of an individual. The view here is that patterned experiences are arrived at through familiar and repeated experiences of the world, and blend the conscious and the unconscious, the real and imagined and the internal and external. Further, this patterning provides the climate for the infant to be able to transition from an undifferentiated organism into a unique individual.

Post-WWII England was a fertile ground for researchers interested in family psychology and the effects of relationships on development. Perhaps fuelled by the catastrophic events, impact on communities, ethnic groups, and society in general, and the enormous sense of grief and loss for extended families, the principle of survival emerged as a pioneering force. Psychologically, the ramifications were no less important. Here the term survival becomes analogous to physical safety and personal wellbeing and involves a 'reconstruction" of the social, emotional, psychological and cognitive terrain of post-war experiences.

Working in this landscape of change, perhaps the most influential contemporary of Winnicott, was John Bowlby. Bowlby, educated in the same traditions as Winnicott, rose to prominence for his related work in the area of maladjusted, institutionalized and orphaned children. The notion of survival was at the heart of Bowlby's work and provided the impetus for a growing belief that separation was key to understanding psychopathology, rather than unconscious processes of fantasies, subjective representations and an infant motivated only by need. The full-scale theory of attachment that materialized from his clinical and empirical, and previously unrelated fields, has permeated many fields of psychological work. The illumination of the theory's vital precepts provides a critical leap in the explication of early social-emotional development within the context of the caregiver-infant relationship citing issues of separation and loss, and the emergence of attachment behaviors as catalysts for development.

Attachment Theory and the Salience of Touch

What started out as clinical observations of children in institutions and hospitals and writings on maternal deprivation in the 1950's transformed into a theoretical trilogy of *Attachment and Loss* (Bowlby, 1969 – 1980). These seminal papers heralded a dramatic paradigmatic shift in how early socioemotional development and close relationships were viewed, but began first and foremost with resounding support for the converging opinion that the quality of intimate processes of infant and mother (primary caregiver), were said to hold the key to the infant's social, emotional, cognitive and personality development (Bowlby, 1973, 1980).

The extensions of these notions combined previously unrelated areas of empirical endeavour – ethological, evolutionary and biological principles were applied to the interactional world of the infant – with sweeping results.

The application of ethological principles largely drawing on the work of Konrad Lorenz (1963), and drawing explicitly on Darwin's work on evolution, touted the adaptive function of behaviour. Here is was held that members of species arrive into environments already equipped to adapt to them, and thus maintain survival through a process of natural selection i.e. genetic transmission of survival traits. Key here, are thorough and detailed observations of species in their natural settings. The documentation of imprinting or "following" behaviour in ducks (Lorenz, 1963) encouraged Bowlby to conceive that human infants arrive with in-built communicative repertoires that signal a mobilization of care and protection behaviours in mothers, thus assuring survival. Here, the conception of an appraisal mechanism controlling these processes was key to understanding the *attachment* of infant to adult. Again an active infant was posited, enveloped in a system that must be

complementary to the infants needs. Using evolutionary principles, this argues for a genetic bias to *attach* to another in the earliest days of life, and underpins the notion that psychological maturation is ubiquitously bound in close relationships.

Bowlby and his colleagues sought to operationalize their theoretical postulates and in the ethological endeavours of Mary Ainsworth and her studies of primary caregiving relationships in Uganda and Baltimore the theory had its champion. Fine-tuned and detailed descriptions in the field were expansive and provided much needed empirical support for the theory.

Moreover, the consistency of findings led Ainsworth to extend the basic tenets of *attachment* to submit that the mother provides a "secure-base" from which the infant can explore the world and return to in times of need. Further, it is suggested that maternal variables, particularly sensitivity to infant communicative cues '…and its role in the development of infant-mother attachment' (Bretherton, 1992), are paramount.

Attachment Theory espouses that embedded in intimate exchanges, are "secure-base behaviors", indicating the quality of the relationship. Contemporary support for these tenets suggest that crying, looking, sucking and rooting expressions are behavioural examples that are "organized into states, rhythms, reflexes and congenitally organized behaviors" (Vasta, Haith & Miller, 1995, p 182), in the newborn and that these "promote proximity to ones caregiver and have an evolutionary basis" (Campos, Barrett, Lamb, Goldsmith & Sternberg, 1983).

According to Attachment Theory, proximity seeking indicates a preference for that person, particularly under circumstances of stress and fear. From and evolutionary perspective, proximity seeking ensures survival because physical closeness to the

mother guarantees an environmental scaffold for the infant. Sensitivity on the part of the mother to her infant's cues, in turn develops expectations in the infant of the mother's availability (or unavailability), and of how to access her in the future. Moreover, the infant characterizes these expectations according to the theory, as "internal working models" or mental representations of the caregiving experience. It is these representations, providing strong attention to the infant's appraisal capacities noted earlier, that stretch into representations of the world and self, and are held to mobilize "strategies and goals that come to organize the child's attachment behaviour" (Fraley & Spieker, 2003, p 388). In particular consistent recurring patterns of interaction promote a "dovetailing of the infant attachment system and the caregiving system of the adult" (Ainsworth & Bowlby, 1991, p 8).

In order to mobilize these postulates, Ainsworth and her colleagues developed the Strange Situation (Ainsworth & Wittig, 1969; Ainsworth & Bell, 1970; Ainsworth, Blehar, Waters & Wall, 1978), a laboratory bound and well documented procedure for assessing attachment status in young children between the ages of 12 and 18 months. This study found a direct link between maternal sensitivity and the expression and organization of attachment/interactive behaviors of the infant. Subsequently, infants were classified into three categories – Secure, Anxious-Avoidant and Anxious-Resistant (Patterns B, A and C respectively) – depending on the array of behaviors exhibited during separation and reunion phases of the Strange Situation. More specifically, it is claimed that reciprocal patterns of interaction lead to secure attachment style. Conversely, an insecure attachment style develops when elements of sensitive caretaking go awry. Later a fourth category was added to

account for those children who did not fit the three categories and were classed as disorganized/disoriented (Main & Hesse, 1990).

Whilst it is impossible to quantify the plethora of research using this paradigm and outside the scope of this thesis, it is important to highlight that studies have linked a secure attachment style to synchronous dyadic interactions (Isabella, Belsky & von Eye, 1989), developmental growth in expressed emotion (Kochanska, 2001), sociability and compliance in toddlerhood (Erickson & Egeland, 1987), while an insecure attachment style has been associated with hostility and poor social interaction in preschoolers (Lyons- Ruth, Alpern & Repacholi, 1993). Further, a disorganized attachment style has been associated with externalizing problem behaviors (Lyons-Ruth, 1996), and these findings are in turn mediated by such factors as poverty, maltreatment, substance abuse and adolescent parenthood (Carlson, 1998).

Furthermore, the proliferation of research spawned from the core claims of Attachment Theory have attracted researchers attempting to explain *how* early mother-child relationships develop. In particular, questions have been raised as to *what are the processes of change* for individuals, groups and dyads, and how early patterns of connectedness are related to relationships across the life span (Fraley & Spieker, 2003). In fact issues of *change* and *continuity* underscore some of the criticisms of the theory. Some researchers have pointed to consistency of attachment classifications across early childhood (Waters, Merrick, Treboux, Crowell & Albersheim, 2000), while others still point to the capricious reports of the strength of early attachment classifications to predict future outcomes (Belsky & Cassidy, 1994). Further, these authors also outline the findings that this is particularly true for specific areas of development (Belsky & Cassidy, 1994). Some authors have concluded that

stability of classification of attachment status can be consistent or inconsistent (Thompson, 2000). Moreover, it is concluded that 'both developmental history and current circumstances' (Thompson, 2000, p 146), can influence attachment status, but that for individuals it is their "relative influence" that varies. In other words, while not suggesting that early experiences do not have an effect on later development, it rather rejects the 'deterministic' nature of early experiences purported by the theory. Support for this concern is argued by authors who stress the potential effects on personality of later social experiences (Harris, 1998), the complex nature of dynamic familial interactions (Lamb, 1997), and that social relationships go beyond the dyadic mother-child system spilling into multiple relationships in multiple environments. Here it is held, that a dyadic model, that posits the earliest relationship as the embryo for all future relationships, does not fully address the multidimensionality of human social relatedness.

However, despite these criticisms and others, several studies have acknowledged variation of factors at an individual level while confirming the theoretical and empirical foundations of the theory. For example in a recent study it was found that caregiver's behaviours are responsible for the child's attachment style but the expression of that style is mediated by individual temperament (Vaughn, Bost, & van Ijzendoorn, 2008). In addition research using the Strange Situation in different cultures overwhelmingly points to confirmation of classification of attachment status despite expressive differences in the three basic categories– secure, anxious-avoidant, and anxious-resistant (Tronick, Morelli & Ivey, 1992). Researchers however, have touted the idea that there are hierarchies in relationships (Rutter, 199), effectively replacing Bowlby's notion of monotropy – that the first significant relationship is

existential to all others. Thus the theory has evolved and has continued to offer new insights into the role attachment plays in the intimacy of human relationships.

Tracing the evolution of attachment theory and its attendant principles provides fertile ground for a discussion on the interrelationship of phylogeny and ontogeny in human development and characteristics of how social interactions are constructed from the earliest moments. While a theory that spans over fifty years of treatment in the literature warrants such attention, in the context of this thesis several pertinent features demand particular explication in relation to the significance of touch in early relationships.

An examination of the original papers expounding the theory and those operationalizing its underlying assumptions, provide cogent but somewhat overlooked data that are both informative and instructive. From the outset Bowlby (1969), viewed close bodily contact with the mother as a feature of close interactions that signaled the end of a sequence of proximity-seeking attachment behaviour in the infant. Nativism guided Bowlby's assertion that 'there is in infants an in-built need to be in touch with and to cling to a human being' (Bowlby, 1958, p 350). He went on to suggest that 'clinging is one of the component instinctual responses which underlie the child's attachment to the mother' (p351). Further it is suggested that Bowlby saw that the achievement of physical contact with an attachment figure was not only emotionally laden but the "ultimate signal that the infant is in safe (secure) circumstances' (Main, 1990, p 462).

Without doubt the behavioural imperative of apprehending and maintaining proximity to the mother and the ensuing patterns of responsiveness are critical to the theory. A full intimation of the limitations of the theory is not offered here, but rather

a critical exposition of the role touch – a primary tenet of evolutionary significance – played in early empirical endeavours and the relative neglect of the value of the tactile modality as an agent of social construction.

More specifically this modality was translated into cogent descriptions of 'close bodily contacts' and the functions they serve. Early attempts to distinguish the contextual features of mother-infant interaction by microanalysing behavioural contingencies are littered with references to tactile behaviors. In particular Ainsworth and her colleagues were leading the field in their detailed analyses of older infants. Included in these findings are that infants can be soothed by being picked up and held (Bell & Ainsworth, 1972), that feeding and bodily contact are of equal import to assessing the quality of interaction (Blehar, Lieberman & Ainsworth, 1977), that infant attachment classification indicates the proportional emphasis of bodily contact by mothers during interactions (Tracy & Ainsworth, 1981), and that contingencies and style of handling was more promoting of secure attachment than the total amount of time the infant was held (Ainsworth, 1979; Weiss, Wilson, Hertenstein, & Campos, 2000).

In one of the earliest studies Ainsworth and Bell (1970), examine those behaviours that promote or discourage contact. These include: "approaching and clambering up, leaning, clinging, embracing, clutching, holding on, resisting release by intensified clinging, clambering back up, push away, hit or kick adult seeking to make contact, squirming to get down" (Ainsworth & Bell, 1970, p 55). What is of interest here is that contact behaviors are registered in three out of the five categories of the coding schedule. More noteworthy however is the fact that because microanalysis "was based on detailed coding of behaviors in which the contingencies of the mother's or stranger's behaviour had to be taken into consideration" (Ainsworth & Bell, 1970,

p 55). Contingent responsiveness in the dyad has received much attention in the abundant literature exploring such constructs as affect matching, mutual regulation and turn taking to name but a few, and are typically tied to perceptive and detective capacities in infants and shared responsiveness in mothers (Weinberg, Tronick, Cohn & Olson, 1999). While the nature of 'contingent responsiveness' will be explained later in the discussion, suffice it to say at this juncture, this early consideration of contingencies was insightful.

Ainsworth and Bell (1970), used a 7-point scale of attribution, "on the assumption that not only could the same behaviour be manifested in different degrees but that different behaviour could serve the same end under different intensities of activation" (Ainsworth & Bell, 1970, p 55). This point is particularly salient for considering the role of touch in interactive patterns in infants and their mothers and offers support for two principles of touch as outlined in a recent review of the communicative functions of this modality (Hertenstein, Verkamp, Kerestes & Holmes, 2006) – equifinality and equipotentiality. The former refers to the fact that "the same communicative output can be achieved via a number of different means (e.g. anger may be communicated via a slap or a push)" (Hertenstein et al, 2006, p 9), while the latter is suggesting that "the same type of touch can be assigned very different meanings or consequences (e.g. an arm around one's shoulder interpreted as loving or display of dominance", (Hertenstein et al, 2006, p 9). While these principles equally apply to other communicative displays, they imply caution with regard to the ascription of meaning to particular communicative displays. For example, understanding that different types and quality of touch can have different effects based on such factors such as the variability of their valence, hedonic tone and distinguishable qualities is important. Accordingly the perception and discrimination are held as key to these processes

(Weiss, 1990). What is clear however is the involvement of context as an exigent backdrop. Certainly the communicative context is critical here as one comprehends the dynamic nature of touch and its embeddedness and coexistence with many forms of expression. Moreover it is the patterns of interaction that develop over time and contexts that are equally deserving of attention.

Exploring the landscape of the patterns of attachment, has propelled Attachment Theory, and its prolific literature, into a wide range of fields. Extensions of attachment theory have pointed to the significance of later attachment relationships for older children and across the lifespan (Kaplan & Cassidy, 1985; Main, Hesse & Kaplan 2005), the transactional processes underlying interactional histories (Sameroff, 1975; Sameroff & MacKenzie, 2003), that over time attachment status shows stability or instability depending on the quality of the environment (Thompson, 1998; Sroufe, 1996), that maternal responsiveness and patterns of attachment are linked to later cognitive abilities (Lewis, 1993), and that attachment patterns vary according to cultural factors (Main, 1990). However, unresolved by attachment classifications are those individuals whose life journey is not predicated on strange situation taxonomies. For example an avoidant or resistant child who is later classed as socially capable, or a secure child who later experiences cognitive and intellectual challenges. The *processes* of attachment development are perhaps less well understood and merit research (Fagot & Kavanagh, 1990). Moreover, analysis of the behavioural indices employed in the original studies (Ainsworth et al 1978), 'found that 92% of the sample could be correctly classified on the basis of a linear combination of the behavioural ratings' (Fraley & Spieker, 2003). Further, 'individual differences were conspicuous' with respect to a range of variables (Ainsworth & Bell, 1970, p 56). This returns the discussion neatly to the

consideration of the role touch plays in emergent forms of intimate interactions. A review of the associations between touch and attachment has been eloquently captured recently (Hertenstein et al, 2006), however the highlighting of key precepts by way of summation is warranted. Critically, touch has both historical and contemporary significance within the context of accessibility and responsiveness in mother-infant interactive environments. In addition, there is strong evidence that touch serves a primordial communicative function cross-culturally, 'even intrinsic to other cultures' (Stack, 2001, p368). Support for the foundational concept that mothering behaviour directly influences attachment style was offered recently in a study that concluded that individual differences in temperament mediated differential effects (Vaughn, Bost, & van Ijzendoorn, 2008). In times of stress and environmental exploration, physical contact is said to organize both the infant's and the mother's behaviour in proximity and contact seeking moments and is said to be "meaningful in terms of the accessibility of the individual in response to infant initiative' (Main, 1990, p485).

Indeed even a decade after the publication of *Attachment and Loss: Vol.1 Attachment* (Bowlby, 1969) early attachment researchers were lamenting the lack of attention to 'close bodily contact' at the expense of 'distance receptors' (Ainsworth, 1979, p933). This lack of attention to the role of touch in early interactions is echoed in the literature today and has served as an impetus for an upsurge in research in the field of touch in the last 20 years.

While some commentators have speculated that this relative neglect is linked to an overarching complexity of form and function (Hertenstein et al, 2006), the search for isomorphism in this regard is hampered by the prevalence of pluralities in the developmental literature. Dichotomies abound – nature/nurture, stability/change,

continuity/discontinuity, male/female, functional/structural, internal/external, positive/negative, availability/unavailability, contingent/non-contingent, dependent/independent – and stress attention to a linear view of developmental phenomena. Common to this call is a search for causal agents of transmission. Exploration of the transmission of inheritance and environmental adaptiveness, fuel the nature/nurture debate, and relativism has the ability to sweep away the potentialities of the constructive organization of interacting systems. Such concerns are at the forefront of Developmental Systems Theory, and critically inform this research.

Dynamic Systems Theory: The Emergent Properties of Touch

At the same time as Bowlby and Winnicott were shifting the tide of developmental psychology toward an organismic view of the individual the exploration of interactional regulation, in particular dyadic processes were being conducted by Sander and his colleagues (Condon & Sander, 1974; Sander, 1962). Their work stemmed from an interest in non-linear dynamic processes indicated in systems accounts of individual variation. The backdrop to the research was General Systems Theory - GST (Bertalanffy, 1966), that while biological in origin, attracted interest due to its insistence on a holistic approach with simultaneous rejection of reductionary processes. Central to the theory were two principles – organization and primary activity (Bertalanffy, 1952). Writers have stressed that it was the interrelatedness of various properties of the systems that represented its uniqueness (Sander, 2000). Significantly this meant that the infant-mother interactional context be seen as a system – the infant, the mother, interactional expressions and

environment formed a fluid, flexible, developing system. Constructivist in orientation, Sander rejected the deterministic notion of others, and celebrated the concept of individuality embedded in niches of which the system was a part. Central to his thesis was the idea of self-regulation as the dominant force in the system's ability over time to develop distinct and intricate methods of exchange. According to Nahum (2000), exchange here is synonymous with communication.

The temporal element included in this model, was said to prove fruitful for tracking change over time, which has been considered particularly useful in the area of mental health (Nahum, 2000). Further extrapolations from General Systems Theory introduced concepts to suggest that *primary activity* correlates to what is expressed in exchanges, and one area of research confirmed that "elements of communicational exchange exist in the gestures, postures and rapidly changing configurations of body movements and adult speech"(Condon & Sander, 1974, p456).

In other words, those conduits of behaviour that are expressed in time and maintained by interactional forces within the system. Further, this translated into how 'we understand adaptation as a fitting together over time, between infant and caregiver, that constructs a new and enduring system' (Sander, 2000, p 9).

The notion of *state* is synonymous with organization and refers to how particular elements are mobilized and integrated. While assumptive, the implication here is that these can be familiar or novel but nonetheless organized interpersonally. Specifically a variety of elements can be identified – among others physiological, behavioural, or emotional - and demand an awareness of the complex processes of the multidimensional phenomena that characterize the evolution in the system across the lifespan. Based on processes of integration, a picture emerges of a mutually

negotiated landscape of experience for the mother and the infant, that does not seek explanations of causality, but instead:

> "we begin to see how the organization of the state of the infant and caregiver as a system, that is the whole shapes the place and role of the part for example, the emergence of the infant as a volitional agent in its own self-regulatory initiation'"(Sander, 2000, p10).

It is important to highlight that this position views the infant as an initiator, as an active participant and architect of the reciprocal interactive exchanges. Further, it stresses the unique ways in which this occurs that cannot be prescripted, but rather once described can indicate how;

> "…a unique infant , within a unique caregiving system, the unique configuration of specific coordinations necessary to achieve an enduring harmony or regulation will be achieved" (Sander, 1987, p 341).

The articulation an epigenetic sequence of adaptive tasks in seven stages of adaptiveness, offered a process model of interactional 'fitting together" that defined ages at which particular competencies in the infant emerge (Sander, 1962; 1987; 2000). From Initial Regulation (the development of sychronicity between mother and infant) to Self-Assertion, and the mature concurrent emergence of Recognition and Reversal in the second year of life, is held to reveal increased 'infant agency' and thus an increasingly coordinated infant-mother system. Empirical evidence for these postulates were found in earlier studies that documented synchronicity in infant motility, and transcribed adult speech (Condon & Sander, 1974). One of the conclusions drawn here, was that a history of coordination and patterned rhythmicity between infant movement patterns and adult vocalization precedes the onset of

expressed language by infant by many months. Further, body movement is key to establishing rudimentary understanding of cultural configurations of expressive language and speech patterns. Another significant finding was that on close inspection microanalytical data emerging during the 1950's, revealed significant intraindividual differences (Sander, 1987). The assertion can be made that these differences, or distinctive features of functioning, can be disguised by normative data seeking, and importantly not reflective of the complex processes underpinning their presence. Of particular value is the connection that can be made between the "adaptive coordination" process of intimate exchanges (Sander, 1987, p 339), and the notion of contingency – that mutual responsiveness is a linchpin in the dyad's ability to negotiate and construct experience. The essential nature of *'contingent responsiveness'* (Beebe, Jaffe, Feldstein, Mays & Alson, 1985), within early interactions will be discussed in more depth later in the review, but it is sufficient to highlight here that variations in the contingent responding of mother and infant shape their relationship in the present and over time.

This changed the lexicon of intimacy, and suggested that developmentalists must consider systems terms that invite attention to process not structure – coherent, integration, organizing, regulatory, self regulatory, construction, contingency – must enter the vocabulary of those seeking to explore issues central to early relationship patterns (Sander, 2000). Individual variation was not only to be expected, but in fact welcomed. Adopting this position leaves one with paradoxical questions – how can we account for an infant that is simultaneously distinct from its mother yet an intimate part of the dyadic system? How can issues of dependency and independency in the infant be resolved? This dichotomous perspective has been countered succinctly by proffering that 'the self is an outgrowth of the dyadic organization that

preceded it' (Sroufe, 2000, p67). Organization within this frame of reference is held to provide a mirror into the processes that give rise to mental representations of the experience. That is, the construction of inner experience or awareness of self – in relation to self and other – is achieved through action and agency (Sander, 1987). With echoes of psychoanalytic theory here, the position is advanced that 'goal-organized schema' are an outcrop of 'frequently recurrent regulatory situations in the system' (Sander, 1987, p342). It is through the processes of experience and re-experience within mutually modified interactive patterns, rather than internal drives and needs, which encourage the construction of self-awareness.

Yet the reader is reminded that individual competencies emerge as part of the process. These competencies e.g. initiating and organizing self-regulatory behaviors, and the move to understanding processes in the intimate caregiver child system are 'what is required to bring about change from states of lesser to states of greater optimality will have significance over the entire developmental process' (Sander, 2000, p344). Optimization is more important here than categorization. However, a cautionary note – the concept of optimization is not seen here as a trajectory toward homogeneity of skills. In other words, optimization of the system does not translate to a prescribed set of principles or checkpoints for the mother-infant system. Rather, it is the patterning over time and organizational integrity that optimize the participatory capacities of the infant in increasingly complex interactive exchanges.

It has been important to elucidate Sander's views at length for several reasons;

> The advocation of detailed observation of mother infant interaction, and the microanalysis of their interactions have informed the dynamic perspective on the non-linear nature of human development.

> Searching for and embracing uniqueness in developmental systems provides a haven for variability that need not be reduced by sophisticated statistical methods.
>
> The focus on interrelated processes has indicated that an infant's developmental repertoire increases with age through a coordinated and contingent action with the mother.
>
> The propounding of an active infant at birth, capable of motor responses that attune to adult speech, suggests temporal structuring of early interactions provide the impetus for later development.
>
> Within this frame of reference it is possible to conceptualize a lifespan approach that remains context focused and sympathetic of changing environmental factors, and that informs the emergent properties of later close relationships.

It is here, that the Sander's unique contribution to the field of human development can be brought to bear on the current study. Critically, it is the processes underlying interactional facilities that have both theoretical and empirical salience. Researchers, who see the true value of systems theory, in the application of its properties to various fields and domains, support this idea. Specifically, it has been suggested that methodologically, systems theory indicates time series designs, where observations are 'frequent enough to capture the relevant properties of the underlying developmental process (van Geert & Steenbeek, 2005, p436). These authors petition

researchers to consider an expansive view of development that apprehends the 'links between short and long term parameters' (van Geert & Steenbeek, 2005, p434). Further, it is suggested that multicontextual and multivariable factors be explored across single subjects to clarify the essentials of interactive process, which is supportive of explicit representation of what is observed, rather than relying on statistical manipulations that can reduce variability to error. The use of numbers of single cases is both time consuming, yet rich in its yield of transactional data.

These suggested methodologies resonate with the painstaking observations of Ainsworth and colleagues (Ainsworth & Bell, 1970), the microgenetic explorations of early communicative acts (Hsu & Fogel, 2003), and microanalysis of infant responses to affective displays (Cohn & Tronick, 1988).

These sentiments are echoed by Ether Thelen and her colleagues (Thelen & Smith, 1998; Thelen & Ulrich, 1991)), who raised the awareness of dynamic systems theory as a *metatheory*, a theory with applied properties to serve a range of fields. Stemming from early research exploring infant motor development, through complex careful observations of infants, evidence for individual variability, the role of contextual factors and the abandonment of cause and effect is posited. The model of applying these principles is found in:

> "…a science for systems with a history, systems that change over time, where novelty can be created, where the end-state is not coded anywhere, and where behaviour at the macro level can, in principle, be reconciled with behaviour at the micro level" (Thelen & Smith, 1994, p49).

Further, extrapolating to child development the mother-infant system:

> "…by its nature seeks certain stable solutions. These solutions emerge from relations not design" (Thelen & Smith, 1994, p xix).

According to researchers, the emergence of new forms of motor behaviour was attributable to the 'assemblage' of preexisting competencies (Thelen & Smith, 1998). Thus, crawling emerges when infant strength (ability to maintain a crawling posture), show coherence with a self-organizing impetus (get across room, attain a toy). Rather than crawling being a natural consequence of maturation, these authors argued that it was a "solution to a problem" (Clearfield, Diedrich, Smith & Thelen, 2006, p 87), arrived at in real time.

One of the most enduring legacies of this position is unwavering belief that action promotes development. A simple experiment involved connecting an infant's foot to a mobile via a ribbon. Through repeated movements, the infant randomly activates the mobile at first, and then later leg movements become contingent on the mobile's auditory and visual qualities. These new contingencies become part of a behavioural array the infant has arrived at in response to the environment demands over time

By including the dimension of time, researchers can accommodate the idiosyncrasies and variability of individuals, e.g. infants who bottom shuffle rather than crawl, and the different time scales that can represent universality in developmental milestones (Thelen, 1994). This view suggests that the relative stability (remembering that the system is always in a state of change), of behavioural forms is "a summary statement over many individual moments, each individual made in a complex system of interacting processes" (Smith, Thelen, Titzer & McLin, 1999, p235). The developmental "pull' toward these forms, represent recurrent patterns that have

stabilized and are increasingly predictable' (Granic & Hollenstein, 2003, p644). However, by emphasizing the present, or 'real time' concept the ideas discussed above are at odds with other researchers in the field.

Within this frame, touch is both contextual and process oriented. Yet there exists within developmental systems perspectives two opposing factions (For full and cogent summaries see Overton & Ennis, 2006a, Overton, 2007; Witherington, 2007). Divided by orientation in particular the marshaling of both methodological and theoretical underpinnings (Witherington, 2007), both share the attachment to the systems concepts of process, self-organization, non-linear development and action within context, but differ in their treatment of time, analysis and causality (Overton, 2006a).

> "While the two part-metatheories for a complementary relational whole, organicism is oriented toward inquiry into the universal, the necessary, system, form-pattern and integration-differentiation. [Mechanistic] Contextualism addresses the particular, the contingent, acts in context, the functional-causal, and differentiation-integration." (Overton, 2007, p158).

The reader will recognize that the work of Thelen and her colleagues fits within the mechanistic-contextualism frame of reference. Temporality here, is limited to the here and now rather than in its broadest application across the lifespan. Contextualists (e.g. Thelen & Fogel), it is held 'eschew psychological constructs such as object permanence or theory of mind and regard only real-time actions in specific contexts as viable source material for dynamic systems modeling' (Witherington, 2007, p129) while those following an organismic orientation "fully admit higher-order forms into its explanatory framework … embraces all forms of causality, considers

developmental time as emergent from but not irreducible to real time …" (Witherington, 2007, p129). This position is sympathetic to the notion of 'self-awareness' propounded by Sander (1987).

This brief summary is offered as a point of reference for the ensuing empirical research, and also to proffer that the opposing world-views need not be mutually exclusive. To do so would be to lose elements of each that are complementary to an holistic approach – 'The I-thou relationship … is a living relationship' (Weber, 1990, p26), and as such should reject any attempt to reduce the relationship to a 'fixity' within the theory. Overton (2007), offers a partnership or coalition between the two groups in the form of a relational metatheory that places time and action for example on a continuum of experience, changed and shaped by the 'investigative focus' (p157).

Insight into these differences, drive an orientation toward the more inclusive model of systems theory offered by organicism-contextualism for the current research. It is important to note that any tentative adoption of this position, cautions against the abandonment or dismissal of 'variability' as a construct of import. Perhaps this caution is one of semantics – the term itself invites notions of flexibility and individualism – and hints at the spontaneity of human interactions, that in the context of communication strategies need not always be calculated or prescribed. To accept otherwise, would be to suggest that interactive partners unfold their behaviors like well rehearsed scripts. This is not to suggest that infant's development must be reduced to an array of components that given the right contextual environs will become 'softly assembled' in real time as contextualists suggest (Witherington, 2007). However short term micronanalytical examinations of properties of interactive behaviour (Hsu & Fogel, 2003), do offer insight into stability and emergence of novel

forms of behaviour. What they fail to achieve however, is the ability to accommodate both a long and short-term perspective of developmental time. This is a compelling framework for a discussion on the communicative functions of touch in interactive displays, across the first year of life.

Before leaving the discussion on the application of dynamic systems theory to developmental concerns, it is important to recapitulate recurring themes and relate them to the emergence of touch as an organizing modality of communication.

Since the 1950's, there has been a proliferation of theoretical models that have at their heart notions of self-regulation and organizational assumptions, and process orientations drawn from Systems Theories. These include, the bioecological perspective (Bronfenbrenner, 1979; 1994), transactional models (Sameroff, 1975), organizational principles (Sroufe, 1979, 1996), and call attention to their application in fields such as emotional development (Lewis, 2000; Lewis & Granic, 2000), communication (Fogel, 1993), biophysiology (de Weerth & van Geert, 2002), epigenesis (Gottlieb, 1991), and developmental psychopathology (Granic, 2005). Within this body of literature, adopting a systems perspective of development, there has been little, or no explorations of the role of touch as an organizing factor in social interactions until most recently. This is partly due to the fact that systems theory, in general terms, is not a theory of development but an approach of application - the application of principles and processes to developmental phenomena. It is also partly due to the fact that the complexity of developmental processes, almost demand unbounded philosophy. If processes are truly unique, are constructed not determined, are self-regulated not scripted, and are emergent not convergent, then an open theory is suggested. Perhaps this is why two opposing systems 'camps' exist in the literature, and why the esoteric nature of private and intimate expressions of communicative

exchanges continues to be explicated. Explanations of uniqueness and variation, as systems theory would indicate, should sit alongside universal explanations of behaviour and the identification of 'difference' as a quasi-political process. Studies that seek to categorize human social development, run the risk of condemning developmental findings to pathology, without exploring coexisting contextual and process variables influencing the system.

It has been eloquently suggested that:

> "Nature is the *product* of the *processes* that are the developmental interactions we call nurture" (Oyama, 2000, p 48).

By this the author is claiming that nature is not 'transmitted' via the interaction between genotype and phenotype but rather constructed variably 'in which heterogenous resources are contingently but more or less reliably reassembled for each life cycle' (Oyama, Griffiths, & Gray, 2001, p1). This position rejects dichotomies, in favour of construction and reconstruction in interaction, that over time, have predictive value.

It is reasonable to assume that systems theory, whatever the orientation, can accommodate touch patterns as emergent properties of the mother-infant system, as an organizer of the systems constructed reality and part of an integrated pattern of optimal connectedness over time. Whilst speculative, recent evidence confirms these potentialities, from areas of research directly influenced by systems theory, and attention to microanalytical examination of processes of change in dyads over time.

Before the contemporary understandings of touch and its roles in development are surveyed, it is important to establish what touch is and how one might perceive its

communicative qualities. There are direct connections with the research discussed thus far, and studies that indicate the properties of touch within primary relationships will be highlighted.

What is touch?

> "In the very act of touching, one is touched in return" (Merleau-Ponty, 1962, p322)

How eloquently this quote encapsulates the idea of reciprocity and mutuality in the act of touching another. Moreover, the idea that one cannot touch someone without being touched oneself is central to the idea of how foundational touch is in ones communicative repertoire. Endorsement for this sentiment is echoed in the suggestion that unlike other senses, touch cannot dwell in the private domain – "I can see but not be seen, I can hear without being heard" (Weber, 1990, p 24) – an important demarcation with reciprocity as an imperative. This inevitable link with the notion of bidirectionality, is supported empirically (Cohn & Tronick, 1988; Lavelli & Fogel, 2002), and theoretically (Frank, 1957). For the latter this is achieved:

> "through the earliest bodily contacts and other tactile experiences, the baby communicates in a reciprocal way, mother to baby, baby to mother, one evoking from the other what will in turn evoke his or her response in a tactile dialectic" (Frank, 1957, p 229).

One of the consequences of this discrimination of 'touch' over other sensory modalities, has been a privileging of touch in terms of early developmental gains. Intimately tied to early studies showing touch as the first sense to develop in the fetus

(Hooker, 1952, cited in Gottlieb, 1990), models suggesting the early activation of cutaneous processing in different species (Gottlieb, 1983), the role touch plays in the survival of an infant (Ainsworth, Blehar, Waters & Wall, 1978; Montagu, 1971), the use of touch to soothe and quiet the infant (Brazelton, 1990), and the lengthy period following birth in humans where the infant relies on body contact for physical support, nutrition, handling for hygiene and positioning, all contribute to an acceptance of the primacy of touch in early development.

For those operating within a deterministic frame of reference, this fuelled the notion that 'the earlier something develops, the more fundamental it is likely to be' (Montagu, 1971, p 3). Yet even with seminal calls for attention to touch as foundational *and* part of an integrated array of communicative modalities (Frank, 1957; Merleau-Ponty, 1962; Montagu, 1971; Sander, 1962,), researchers have been slow to address the paucity of work exploring its properties. Acceptance of the role the largest organ in the body plays – skin is approximately 16% of normal human body weight – as a regulator of sensation and warmth is often quoted, and a definition of touch supplied (Hertenstein, 2002; Stack & Muir, 1990; Weber, 1990). Two of the definitions are useful entry points by way of answering the question that opened this section – "*Touch* can mean 'to be in contact with" (Weber, 1990, p12) or it can mean "to reach and to communicate"(Weber, 1990, p 13). If one were to accept that these terms are complementary *operationally* one can begin to unpack the complexity of touch as a communicative modality. Moreover, through this complementarity, parallels with the unified theoretical views of Overton (2007) can be drawn. To reiterate briefly, the divergent orientations of the contextual and organismic approaches are held as two parts of the same whole within a 'relational developmental metatheory' (Overton & Ennis, 2006a,). So, just as Merleau-Ponty

indicates the nature of reciprocity in touch, so too is the call for "treating the two [structure and function] as reciprocally related standpoints that open the door to interesting and valuable multidisciplinary projects" (Overton & Ennis, 2006, p 169).

Within the context of these disparities of theoretical orientations, Weber (1990), confesses she has not reached a full understanding of what touch is and reminds the reader that:

> "…even without these complex philosophical models, people have for millennia touched their children and each other in an expression of love and human concern, with beneficial results, whatever models we invoke" (Weber, 1990, p 39).

This is a pertinent reminder how the 'cradle of understanding' transcends theoretical and methodological differences and limitations, and metaphorically at least requires that one holds to a faithful representation of the intimacy in early mother-child exchanges. It is to these exchanges that the discussion now turns.

The Role of Touch in Mother-Infant Communication.

Embedded in the theoretical positions outlined above, are genuine attempts to capture the psychological significance of touch in mother-infant dyads. From beginnings in the work of Spitz (1946) and the observation of depressed infants starved of physical contact from their mothers, distress in human children separated from parents (Bowlby, 1953), and the notion that tactility was a message carrying system for infants and their mothers (Frank, 1957), researchers early attempts focused on maternal variables to explain developmental outcomes. Moreover, many authors

connected maternal tactile acts with love (Balint, 1949; Darwin, 1872; Harlow, 1958; Montagu, 1971).

This is unsurprising given that early caregiving is characterized by contact behaviors – handling, changing, feeding, bathing, rocking, patting, rubbing – that dominate early care patterns (Carlsson, 1978), that have been suggested as part of an evolutionary process (Montagu, 1971, Rubin, 1963), and through repetition provide the mother with discriminating powers of identification of her own infant (Kaitz, Meirov, Landman, & Eidelman, 1993).

Yet within repetitions of care, lie patterned tactile experiences that have communicative and long-term importance for the dyad. This discussion begins with an outline of the research that has documented details and dynamics of mother-infant interactions, and the development of a literature that has come to appreciate the unique qualities in them. In particular, the social functions of the interactions are critical as are the contexts in which they occur.

Face-to-Face Interactions

Of all the contexts in which mother-infant interaction occurs, the primacy of face-to-face interactions has been the focus of research. The major functions of these interactions have been suggested as 'the promotion of social understanding, development of attachment, acquisition of language and emotion regulation (Bornstein & Tamis-LeMonda, 2001).

Support for the efficacy of face-to-face interactions as a research paradigm was soon expounded by the clinical and empirical efforts of Stern (1974, 1995), elaborated by

the microanalytic procedures of Trevarthen (1977), Tronick and Cohn (1988, 1989), and further enhanced by the specificity of models introduced by Beebe, Jaffe, and Lachmann (1992), and Fogel (1993, 2007). From a dynamic systems perspective, the "continuous process model of communication" suggests that "*communication produces a net gain of information* in the system (Fogel, 2007, p 252, italics theirs), and outlines the communication process as two-way, characterized by consistency and variability.

The premises from which these terms have emerged, while divergent are unquestionably interpersonal. The emergence of such terms as coordinated responsiveness (Van Egeren, Barrat & Roach, 2001), the coregulating effect of interactions (Toda & Fogel, 1993) mutual regulation (Kaye, 1982) synchrony (Feldman & Eidelman, 2006), intersubjectivity (Trevarthen, 1993, 1995), moments of meeting (Stern, 1998), dyadic coordination (Moore & Calkins, 2004), alive communication (Fogel & Garvey, 2007), mother-infant attunement (Beebe & Sloate, 1982), reciprocal interpersonal interactions (Hobson, 1993), speak to the importance given to the detailed analyses undertaken. In addition, it is clear that this multifarious glossary not only seeks to explain the intricate nature of interactions but intimates at the complexity of the influence of each interactant on the other. Without doubt they are the hallmarks of the nature of *dyadic interaction* and the developing uniqueness of the dyad, and mark a shift in emphasis away from the study of the individual, the expectation of an active infant, and the temporal features of intimate exchanges.

Temporality was the major feature of the work accomplished by Stern (1974), examining the minutiae of mother-child interactions as they unfold in time. These

interactions detailed the subtle shifts in the regularities and irregularities of the interactions, characterized by, among others, turn-taking or 'sequential structure' (Cohn & Tronick, 1987), acts of coordination (Tronick, Als & Brazelton, 1980), and 'affective configurations' (Weinberg & Tronick, 1994), pause patterns in conversations (Beebe, Alson, Jaffe, Feldstein, & Crown, 1988), and rhythmic patterning (Brazelton, Koslowski & Main, 1974).

Subsequent studies, dominated by time-series designs (Cohn & Tronick, 1989; Symons & Moran, 1987), exploring quality and content of exchanges, posited maternal sensitivity and responsiveness as key to the maintenance of high quality interactions. Moreover, given the essential dyadic methodologies governing the research, *'contingent responsiveness'* (Van Egeren, Barratt & Roach, 2001, p 684, italics theirs), opened the door on the emergence of programmes examining infant variables. In particular this meant attention to how infants were attuned to the mother's expressive behaviour (Stern, 1974), and how synchronized their behaviors – smiles, body movements, gaze and vocalizations – were with mothers engagement style. Change over time and mutual influence mark the 'interdependence of mother and infant' (Hsu & Fogel, 2003), and have been linked to attachment classification (Isabella, Belsky, & van Eye, 1989), temperament and self-regulation (Feldman, Masalha & Alony, 2006), and emotion regulation and development (Tronick, 1989).

An early study (Peery & Stern, 1975), exemplifies the intricate detail of analysis, the use of video data to capture interactions, and the gathering of data in the dyads home to appropriate ecological validity were all features of import. Gazing in infants and their mothers were assessed during bottle-feeding, spoon-feeding and play and compared mean and median gaze durations in each, and total percent of the time each gazed at the other in each of the activities. Authors analysed a reported 27 hours of

video data for the ten infants and their mothers, and included mean not-looking gaze behaviour in each condition. They found that mothers looked at their infants approximately 70% of the time, while infants gazing ranged from 20% to 30% of the total time. Importantly they found that mothers and infants spent almost the same amount of time not-looking at each other across conditions. Perry and Stern (1975), interpreted their results from a motivational-arousal perspective suggesting that 'on a moment-to-moment basis, any dyadic visual interaction is a process of regulating the intensity of interpersonal contact by either looking at or avoiding ones partner' (p. 212-213). This highlights an early apprehension of the importance of dyadic regulation in particular the need for both to 'attentuate the eye-to-eye stimulation' (p. 212).

In another study, videotapes of interactions of mothers and infants in a laboratory setting, were examined using the Monadic Phases coding scheme (Tronick & Cohn, 1989). Dyadic states were evaluated according to the mean amount of time spent in each phase. Crucially, in addition to this they calculated matching and synchrony scores that measured the degree to which behaviour was expressed by the mother and the infant at the same time, and the degree to which behaviour is altered in one relative to the other. Findings indicated that while coordinated states increased with age, proportionally the time spent in coordinated states was small. Findings also pointed to gender and age differences – mothers were more coordinated with their sons and coordination increased from 3 months to 9 months. However, these findings were discussed in terms of synchrony, dyssynchrony and the reparation of miscoordinated interactions. Further, the implication is that cycles of coordination and miscoordination are to be expected as part of patterns of interactions. Indications from this research suggest that 'a lack of coordination is common and

expected…both partners have the opportunity to experience reparation and to further elaborate their interactive coping skills as well as gain a sense of effectance' (Tronick & Cohn, 1989, p 91). This forms the basis of Tronicks Mutual Regulation Model (MRM), the notion that 'infant affective organization is simultaneously dependent on both the infant's regulatory capacities and the regulatory scaffolding provided by the caregiver' (Weinberg, Tronick, Cohn & Olson, 1999, p 176).

That this coordination has developmental timepoints, is evidence in the literature. An extensive body of research exists pointing to the early period (birth to 6 months) where uncoordinated patterns gradually over time develop into recurrent patterns of relational knowing (Lyons-Ruth, 1998). By the second half of the first year, the weight of evidence points to an independent goal-motivated infant with an increased capacity to invoke behaviors from the mother and respond more purposefully to her overtures (Sroufe, 1996) – thus greater regulation and initiating power.

Research into gaze and affect – which inform this thesis – are worth pondering more closely. The research on gaze behaviors in dyadic interactions have found significant temporal coordination between infant gaze and maternal behaviors e.g. voice of the mother (Crown, et al, 2002) Around 6 weeks of age infants maintain eye contact with their mothers (Wolff, 1963), state matching such as looking at one another occurs after 3 months (Feldman, 2007; Malatesta & Haviland, 1982; Tronick & Cohn, 1989), and that this coordination is more likely to be displayed between mothers and sons rather than mothers and daughters (Cohn & Tronick, 1989). Further, infant crying, smiling and looking have been indicated as eliciting maternal attention (Ainsworth, et al, 1978), and that gaze maintains proximal contact for social coordination (Stern, 1974). That this array is expected as part of a continuum of emotional experience and that rhythmicity and patterning of en face experiences is

uniquely organized by the dyad is well supported (Feldman, Greenbaum & Yirmiya, 1999).

Gaze patterns change over the course of the first year including a decrease in coordinated gaze (Feldman, 2002). The growth in joint visual attention when both the mother and the child look at the same object, is said to be indicative of understanding another's mental state (Baron-Cohen, 1995). The growth in vocalization and gesture patterns in the infant, coupled with the emergence of social referencing (Scorce, Emde, Campos, & Klinnert, 1985), making eye contact and using the mothers emotional facial displays to disambiguate an environmental event.

Related to, but not separate from interaction, affective displays and emotional signaling contribute from the earliest moments of life to the sustenance of repeated and recurrent positive social connection. That mothers sensitivity expressed in their visual displays and contingent upon their infants affective overtures, is vital to the attachment bond is well established (Bowlby, 1969; Stern, 1985). Infants age 3 months display positive emotional signals in response to positive emotional expressions by their mothers (Kaye & Fogel, 1980). Taken together these are indicative of a literature that has focused on the affective displays from facial expressions as windows to emotional development (Malatesta, Izard, & Camras, 1991). Included in this are negative displays such as fussing, crying and associated negative emotions that are moderated by maternal vocalizations (Bell & Ainsworth, 1972), which have revealed that facial expressions attributed to basic emotions emerge in early development (Camras, Malatesta & Izard, 1991), and that infants have a precocious ability to apprehend, organize and express different affective experiences (Adamson & Bakeman, 1991).

Taken together these findings provide evidence for the complexity of mutuality and reciprocity in mother-infant engagement. Further, gaze and affect become vital ingredients of the synchronous behaviour of both, as they each make unique contributions to dyadic regulation over time.

The regulation of gaze and affect is existentially social, multifaceted and mediated by both maternal and infant factors. How these relate to touch and its relationship to the milieu of emotional expression is both warranted and timely. How infants and mothers 'attune' to one another goes well beyond discrete signal-response patterns (Stern, 1985).

In another study, using the well established and researched Still-Face Paradigm (Tronick et al 1987), changes were expected across age (infants 3 months and 6 months) to the mothers change in facial expression (Toda & Fogel, 1993). Videotapes of the interactions between mothers and their infants in a laboratory setting were analysed for facial expressions, gaze behaviour and motoric movement patterns of each hand. As expected reduced smiling and averted gaze were found in response to the mother's still-face, however there was an increase in hand activity and self touching behaviors from 3 months to 6 months. Authors interpreted these findings as the effects of ontological change in different developmental areas. Specifically the authors comment that – "This work suggests that 'emotional' responses in young infants cannot be judged entirely from the face but must involve the whole body and the patterns of temporally organized action in context" (Toda & Fogel, 1993, p 537). Citing the study of Stack and Muir (1990) and the finding that touch has a moderating effect on responses to the Still-Face, it was further suggested that "it is not clear from this study, however if the effect of touch is related to tactile perception, or to its influence on motor skills or attention" (Toda & Fogel, 1993, p 537). However, not

only did touch elicit positive expressions in infants where gaze aversion and reduced smiling would be expected, but infants also directed their gaze toward the mother's hands (Stack & Muir, 1990). The authors went on to suggest that it is "more difficult to argue that adult facial expressions *per se* control the Still-Face effect" (Stack & Muir, 1990, p 143). The implication here is that context and skill interact to exact differential effects on an infant's response and the coordination of interactional sequelae with the mother.

For some authors these data reinforce the view that;

> "Temporal organization of mother-infant interaction is not strictly or constantly rhythmic: it does not present wholly predictable temporal patterns but rather a form of timing that stimulates frames of expectation and generated improvisation zones; a timing that is at once clearly structured and subtly varied" (Gratier & Apter-Danon, 2009, p 307).

Interactional history becomes important here. Frames of expectation are arrived at through repetition, patterning, recurring encounters and interactional experience, and 'improvisation zones' are those that are mutually regulated, coordinated, negotiated, imitated and reciprocated. Parallels can be drawn here with Vygotsky and the *zone of proximal development* (1967), a term encapsulating the idea that human development has its beginnings in the social context of early interactive experience and that parents have the capacity to pitch their social encounters just above the level of the infant so that over time higher levels of functioning are attained. However as the writers suggest, these zones of improvisation present opportunities for new possibilities of *shared* experience (Gratier & Apter-Danon, 2009). In other words, these 'zones'

provide opportunities for the emergence of innovative and creative forms of *dyadic* relating.

This rejects the conventional treatment of interactional data, as those offered above, that focus on the coordination of discrete signal-response activity within the dyad. These are limited by their fixity and inherent unidirectionality.

It is vital to point out that these data outlined in detail above, and the rich array of studies seeking to explore the qualities of early mother-infant exchanges, have failed to consider touch as a variable of interactional interest. Touch, as a communication variable is either completely ignored or embedded in a composite score of such things as attention or synchrony (Muir, 1990). Certainly the field demands a broad approach to the study of touch, which can begin to understand and unpack the complexity and specificity of touch in communication. One related area is that of emotional development and regulation.

Explorations of the expression of touch in relation to emotion regulation, has been hampered by the lack of a systematic approach to understanding the power of touch to elicit emotion (Hertenstein & Campos, 2001). It is asserted that touch communicates emotional information (Stack, 2001), and this is unsurprising given its primary connection to the attachment system and differential displays of affection. For example mothers of anxious-avoidant infants (Type A), were found to display proportionately more kissing and less full body contact, such as hugging and cuddling, compared with mothers of secure infants (Tracy & Ainsworth, 1981). These findings were consistent with the view that:

> "It was not the total amount of time that the baby was held by the mother that promoted secure attachment so much as the contingency of the pick-up

> with infant signals of desire for contact and the manner in which mother then held and handled the baby' (Ainsworth & Bowlby, 1991, p 338).

Relatedly, reliable elicitation of negative emotional displays, were found in infants, following specific tactile and breathing manipulation by their mothers (Hertenstein & Campos, 2001). This was not true for the manipulation to elicit positive emotion, and the authors explained these findings as evidence for the differential effects of 'specific parameters of touch' (Hertenstein & Campos, 2001, p 549). Other researchers employing the Still Face Paradigm have found evidence for touch eliciting positive emotions (Pelaez-Nogueras, Field, Hossain, & Pickens, 1996). Here the findings suggested that the provision of specific instructions to depressed mothers in a still-face-with-touch procedure, increased infant smiling and gazing, and concluded that the touch countered the effects of the mothers low affect on their infants. The current thesis does specifically explore the role of touch within the field of emotion, however it is worth noting that touch has been found to contain meaning and a valence – affection and tenderness – and the use of nurturing touch has been linked to secure attachment (Weiss, Wilson, Hertenstein & Campos, 2000), and reduction of emotional problems in low birth infants at two years (Weiss, Wilson, Seed & Paul, 2001). It seems improbable that touch and it's connections to emotional development and communication between mothers and infants has received so little regard in the infancy literature.

It has been suggested that the relative neglect of touch in the literature is due to the complexity of touch as a communicative modality with multiple parameters (Hertenstein, 2006). For others, it is due to the fact that face-to-face interactions by their very nature invite attention to 'distance receptors and distal behaviors, and thus resembles, more than interactions in close bodily contact, social interchange

characteristic of older children and adults' (Blehar et al 1978). Writers go on to point out that young infants interact initially in close proximity to adults, often during physical contact e.g. holding, not at a distance to them. Similarly, the widely applied Still-Face procedure, typically conducted with an infant sitting in a chair opposite the mother, employs 'distal modalities e.g. gaze, affect' (Mozkowski & Stack, 2007), as indicators of responsiveness and regulation, with split screen analysis providing a methodological boundary of separateness.

Even when touch has been promoted as primal for development, it has been relegated as a poor substitute for other modalities. The following highlights this point:

> "Touching, moving, gazing and non-linguistic vocalizing provide the media of communication for children in the early months of life. Of these modalities gazing is the first to become fully functional" (Peery & Stern, 1975, p 207).

Early calls for the reassessment of the vitality touch in early development came from other authors who noted that:

> "So persuasive have been the studies of interaction involving distance receptors, that interactions involving close bodily contact, have been largely ignored" (Ainsworth, 1970, p 933).

Thus there are glaring gaps in the literature that have endured for decades regarding the role of touch in development and its regulating effects in interactions. This despite the fact that there is great detail regarding age related changes in gaze, affect, coordinated dyadic states, rhythmic patterning, the effects of interactional capabilities

on later attachment style, maternal and infant variables influencing developmental gains and the differences and unique qualities of infant-mother pairs.

Recent research has begun to explore touch as a primary modality for communication and organization within dyadic interactions and it is this research that will provide the backdrop for the current paper and a frame of reference for it's hypotheses and methodological underpinnings.

Touch and Social Communication in Context

It is over 40 years ago since Frank (1957), paired touch and communication in a seminal interpretation of the inseparability of the two areas of early development. It has been 30 years since Ainsworth's plea to address the role of close bodily contact in mother-infant research and almost the same time since the influential writing of Montagu, *Touching: The Human Significance of the Skin* (Montagu, 1971). Further, it is nearly 20 years since a book, aptly entitled; *Touch: The Foundation of Experience,* was edited by Kathryn Barnard and T Berry Brazelton (1990). These publications act as signposts for an historical narrative of the role of touch in human development, and a wisdom surrounding its importance. In addition, their sentiments echo a call to capture the foundational features of touch, particularly those enveloped in mother-infant, significant other-infant interactions, and a promulgation of ideas to further stimulate research. So it is indefensible that a recent review still referred to touch as 'one of the most neglected modalities of communication' (Hertenstein, et al, 2006,

p 5). Explanations offered above, go some way to attenuating this claim, however perhaps the best form of address is a recent upsurge of interest and growth in research.

Steeped in the traditions of microanalytic assessment of face-to-face interactions recent articles have emerged which explore the dynamics of early interactions, call to attention both infant and maternal variables, and address both quantitative and qualitative aspects of touch in early life experiences. These investigations signal a shift to what is communicated during interactions, place touch in context with other communicative modalities and include temporal factors as vital to the process of emergent interactive qualities.

While the literature makes imperative the bidirectional nature of communicative behaviour, for methodological purposes some researchers direct their attention to either the mother or infant. For the most part, explication of findings from the most recent studies, report both infant and maternal variables while stressing the influence of one over the other. The dearth of touch studies examining infant touching behaviors is marked, and underrepresented in the literature to date. Critical gains in this area are very recent, and implicate a potential growth area for researchers.

The Effects of Maternal and Infant Touch on Mother-Infant Interaction

Just as the literature suggests, it is impossible to conceive communicative touch as an isolated event. In touching, one is touched and hitherto, touch is an experience. The following review, makes connections between touch in the infant and the mother in an effort to elucidate the dynamic processes that unfold over time.

While maternal variables have dominated the developmental literature, very little attention has been paid to the specific touch used by mothers in interaction. Another commentator has suggested the literature is overdue for change:

> "it is time to replace reports of global touch percentages so common in the communication literature with standardized descriptions of different tactile actions patterns that adults use during dyadic exchanges" (Muir, 2002, p 97).

Increased specificity of touch is one of the most significant highlights of the contemporary research. This claim is supported by the introduction of new coding schemes that illuminate functions of touch, types of touch and locations of touch, along with qualitative aspects of touch such as intensity, and critically, in combination with other forms of communicative behaviors such as gaze and affect. These shifts match calls for exploring touch in context with other modalities of communication (Hertenstein et al 2006; Muir, 2002), and clear definition of the touch repertoires of both mother and infant as a basis for better understanding the organization interactions (Muir, 2002). These calls are heeded by Stack and her colleagues, in a series of comprehensive and innovative studies.

A study exploring the effects of touch and gesture on infant behaviour (Stack & Arnold, 1998), used a combination of infant variables – gaze, smiling, fretting, vocalizing – as indices of responsiveness. Results revealed that infants looked at their mother's still-faces when touch and gesture instructions were followed. It was concluded that, "when instructed, mothers appear successful in eliciting specific behaviors from their infants using only nonverbal channels of communication" (Stack, 2001, p 359). While manipulation of instructions maintains a highly

structured experimental environment, and the study helpfully elevates touch as a control variable in interaction, it is limited by the fact that findings are interpreted in light of violations of the expected response – reduced smiling and gazing – and that timing of the reconnection between mother and infant following the SF period must be questioned methodologically (Jean & Stack, 2009).

Indeed in a very recent publication addressing this issue, researchers reported that "the quality of maternal regulatory behaviour provided in the interval between the SF period and Reunion Normal Period was found to influence the amount of maternal nurturing touch in the Reunion Normal Period" (Jean & Stack, 2009, p 123). Decisively, the study employed a new observational tool – The Functions of Touch Scale (FTS), (Jean, Girouard, & Stack, 2007, cited in Jean & Stack, 2009). This tool not only advises nine categories of functional maternal touch, but simultaneously incorporates multimodal aspects of dyadic functioning as a composite e.g. maternal singing in "Playful touch", infant negative affect in "Nurturing Touch". In this way subtle changes in infant affect and behaviour can be coded alongside the mothers regulatory behaviour. Durations and functions of touch indexed both how infant distress can impact on the employment of different touch arrays in mothers, which in turn regulate the quality of interaction for the infant during stressful situations. The FTS, while including infant variables, is explicit with regard maternal responding. Generalizability from this study to a naturalistic setting would enhance the use of the tool by assessing naturalistic infant distress levels, given the lower than expected levels of distress reported in this study. In addition, longitudinal data would be helpful to understand the concomitants of infant touch functions both over time and in varied contexts. This would go some way to addressing the fact that there is little "data on the development of infant productive vocabulary" (Muir, 2002, p 99). In

other words, do infants develop a touch repertoire over time and if so, how can it be characterized?

A longitudinal design was employed to assess the effects of age and context on maternal tactility (Jean, Stack & Fogel, 2009). Using the Caregiver Infant Touch Scale (CITS, Stack, LePage, Hains, & Muir, 1996), infants aged 1, 3 and 5.5 months and their mothers were videotaped playing in a laboratory in two contexts – infant sitting on mothers lap and infant sitting on the floor – and the face-to-face interactions were coded at one second intervals across the two contexts (five minutes per context). The CITS is explicit with regards the type of maternal touch to be coded e.g. tickling, poking, stroking, and results indicated that type of touch varied according to infant age and context. Specifically nurturing touch decreased with age while stimulating touch increased with age. The authors concluded that the implications are that "mothers adjust their tactile behaviour based on their infants development and that within mother-infant interactions, touch may serve different functions e.g. nurturing, holding and support, stimulating" (Jean, Stack, & Fogel, 2009, p 347), and that different types of touch e.g. stroke/rub/caress/massage can have the same meaning. This study highlights change in dyadic functioning over time and the effects of different contexts on touch behaviour. These implications resonate with the notion of equipotentiality and equifinality (Hertenstein et al, 2007), and further support the notion, that touch is central to communication in infant-mother dyads. These authors recommend that "replication with a larger sample size, longer observation time and with more than two contexts is warranted" (Jean, Stack & Fogel, 2009, p 348).

Similar findings were reported in another cross sectional study exploring features of maternal touch with infants at 3, 6 9 and 12 months of age (Ferber, Feldman &

Makhoul, 2008). Conducted in the participants' homes, this study collected naturalistic data in two contexts –caregiving and play- in an attempt to track changes in maternal touch behaviour over time and address the utility of categories of touch as indexes of the properties of reciprocity in dyads. Coding of maternal touch behaviour (Touch Scoring Instrument, Polan & Ward, 1994), and mother-infant interaction (Coding Interactive Behaviour, cited in Ferber et al, 2008), provided discrete touch categories and attention to "maternal sensitivity and dyadic synchrony" (Ferber et al, 2008, p366) with affectionate touch predictive of reciprocity in dyads. Findings that affectionate and stimulating touch decreased with infant age, must be evaluated with caution as "the stability of touch behaviour in individual dyads was not investigated in a repeated measures model" (p 369). Nonetheless, the study supports the role that infant maturation plays on mother's tactile expressive displays. This picture of an active infant participating in complex interactive contexts and the mutual influence of the interactants on each others behaviour is consistent with a dynamic systems model that promotes the exploration of integrated maternal and infant behaviors and how these features are coregulated over time (Fogel & Garvey, 2007).

Indeed one study, employing the use of a dyadic coding scheme (Mother-Infant Communication Patterns, Hsu & Fogel, 2003), in combination with the Quality of Parent-to-Infant Touch Protocol, Goldyn & Moreno, 2002, cited in Moreno, Posada & Goldyn, 2006), the authors found that when touch was manipulated and barred from interaction there was a corresponding decrease in asymmetrical coregulation Results were discussed in terms of relational history, context and infant variables.

To date, only a handful of investigations into infant touch and its role in mother-infant communication have been reported with one of the earliest studies documented by Landau (1989). Using a cross-cultural, cross-sectional design, male infants aged

2,4,7, and 11 months "affectionate responses" (Landau, 1989, p64) – patting, hugging and kissing - were observed. Frequencies, the target adult – usually the mother, and the context of the responses were recorded. Results indicated that infant affectionate responses increased from 7 months to 11 months, but did not appear before 7 months. Results were discussed in terms of cultural patterns of care, the development of intentionality and improved motor capacities. Insightfully, indications that, "hugging, patting and kissing seem to be a group of behaviors that has a high potential for mutual responsiveness within the mother-infant encounters" (Landau, 1989, p 67). This is consistent with widespread findings that tactile behaviour regulates emotions and interactions and is crucial for consistent, coordinated, organized patterns of interaction that inform attachment status and developmental outcomes (Stack, 2001).

The SF paradigm is also represented in the sparse infant touch literature. Toda and Fogel (1993), found that 6 month olds were more likely to use coordinated touching behaviour during the SF period than 3 month olds and this was expressed by among others grasping clothes, touch own mouth or face, or own hands. Results were discussed in terms of developmental change and the integration of gaze and motor behaviour. The integration of modalities of communication has been highlighted as significant for development, and speak to the interdependence of infant and mother long term (Hsu & Fogel, 2003).

In addition to this study, Moszkowski and Stack (2007), recently found similar results with regard to the amount of time infants touched themselves during the SF period using The Infant Touch Scale (ITS) to measure type and location of touch. Moreover, infants used static touch with their mothers proportionately more of the time during Normal periods. The authors conclude that infant touch is prevalent throughout interactive exchanges, and that infants vary their touch responses according to

contextual factors. More importantly the point is made that infants are perceptive of changes in their social environment and that they use touch to regulate their responses to these changes and to communicate the accompanying "affective states" (Moszkowski & Stack, 2007, p 307).

Recently two studies, using SF procedures and two coding schedules – Infant Touch Scale (Moszkowski & Stack, 2007), and Functions of Infant Touch Scale, FTS (cited in Moszkowski, Stack & Chiarella, 2009, article in press), mark a shift in the characterization of infant touch and how it's expressed in intimate exchanges. Moreover, apprehension of the functions of infant touches attest to the growing evidence for the "the important regulatory, exploratory and communicative roles of touch during early socio-emotional development" (Moszkowski et al, 2009, article in press). The FTS (11 functions e.g. passive play, regulatory exploratory) related directly to periods of the SF and relates to the attentional, regulatory, and affectual-communciative (e.g. infant is calming himself through soothing types of touch, infant may be trying to regain mothers attention through active touch), qualities during SF and/or Normal periods of the paradigm.

Interactions between dyads were videotaped in participant's homes where maternal availability was manipulated using the SF paradigm for investigative purposes (Moszkowski et al, 2009, article in press). Coding of types, location and functions of touch was conducted in conjunction with gaze, and affect - neutral, smile and fret. Emotional availability was also coded according to a standard measure. The co-occurence of tactile behaviors and functions showed variation depending on SF period and as a function of maternal availability. For example self-soothing self-touching behaviors and attention-seeking or reactive behaviors were exhibited with averted gaze during the SF period. Further, infants who exhibited less responsive

behaviours during the Still-Face Period, were more likely to remain disengaged during Reunion. The authors findings underscore the idea that infants use touch as a medium of self-regulation and exploration, but importantly that infant touch and functional responsiveness are useful barometers for the quality of dyadic interaction. Again relational history has a bearing on results, and the role played by the quality of maternal and infant touch, for the strength and vigour of dyadic communication, cannot be underestimated.

In a related study, using the same coding procedures as above (Mozskowski, Stack, Girouard, Field, Hernandez-Reif & Diego 2009), infants and their depressed or non-depressed mothers took part in a laboratory assessment of the SF procedure and a variation, separation procedure (SP – where mothers removed themselves to remain physically unavailable for 90 seconds). Differences were found in the behaviors of infants of depressed mothers compared with their non-depressed cohorts. Specifically infants of depressed mothers displayed more reactive and soothing behaviors during the period when their mothers were unavailable, while infants of mothers who were not depressed showed less reactive and more passive touch behaviors. These findings were explained in terms of infant regulatory capacities as a function of the physical availability and emotional sensitivity of the mothers. Again specificity around a structured interactive setting questions the generalizability of findings to naturalistic settings. Even though similar findings were reported when the SF was conducted in participants homes (Mozskowski et al, 2009, article in press), it is reasonable to question what types of interactive situations naturally occurring in home, stimulate similar responses in the infant. If the mother goes out of the room what does the infant do tactually? If the mother's affect is flat and unexpressive due to depression or extreme exhaustion are similar levels of soothing and reactive actions displayed?

What are the scaffolding effects of other significant caregivers when the infant's mother is depressed? These are useful questions to highlight the role of longitudinal and naturalistic studies, that are in no way designed to deprecate the findings here that signify that maternal and infant touch are unequivocally connected to early communicative and socioemotional outcomes for infants and the relationships of which they are a part.

Taken as a whole these vital studies indicate there is significant merit in apprehending the role of touch in the mother-infant relational systems. The implications for attachment, infant development, maternal efficacy and communion of individuals with others, is equivocal. Moreover, methodological limitations aside, the integral nature of touch in early development and its embeddedness in an array of expressive modalities demands attention through a dynamic systems lens to capture the complexity and variability of touch as both an organizational and emergent feature of development. In the recent review (Hertenstein, et al 2007), several gaps in the literature were highlighted. These include the need for microanalytic studies to explore how touch develops in relationships. In addition it is suggested that attention is paid to understanding how infants touch behaviors develop over time and how they learn or develop tactility with others. The literature provides examples of change in this regard. However, longitudinal studies examining infant and maternal touch in naturalistic settings are needed. It has been suggested that this was vital because "at some point infants/children include touch as part of their communication with others" (Muir, 2002, p 99).

Current Research Overview

The present thesis, directly addressed issues outlined in the review by examining aspects of intimate exchanges between mothers and their infants in a naturalistic setting – their own homes. Touch behaviors, in both the mother and the infant were examined. While there are more data pertaining to the differential effects of maternal touch on infant behaviour, and the scarcity of research on communicative properties of infant touch have been elucidated (Muir, 2002), because of the bidirectional nature of communication (Murray & Trevarthen, 1990), touch in both interactive partners will be examined. Further, because research points to the relevance of touch within a rich array of communicative behaviours and its multi-functionality (Stack, 2001), maternal and infant gaze, and maternal and infant affect were integrated into coding procedures. It is anticipated that in doing so, a gauge on the reciprocal patterning and responding of mother and infant will elucidate vital aspects of coordination and covariance. From an ethological point of view, this perspective was expected to chart the consequences of communication, rather than the unidirectional transmission of information (Thelen & Smith, 1998).

By selecting a longitudinal design, several important issues in the developmental and communicative literature are addressed. Firstly, the design offered both within and between dyads examination of touch. That is, the ability to chart development for dyads over time while attenuating the subtle temporal qualities of interaction at specific time points. Secondly, it provided naturalistic data for an extant literature that is yet to arrive at a comprehensive understanding, both theoretically and empirically, of the role touch plays in the multimodal communicative expressions of both mother and infant.

Utilizing prospective longitudinal observational data, the study used a modified coding schedule to measure key aspects of mother-infant interaction. While an emphasis was placed on the development of touch – the type, location and intensity – for both mother and infant, the concurrent measurement of gaze and affect were crucial to elucidating the connections between other non-verbal forms of communication. Dyads were videotaped in their own homes, at 5 time points across the first year of life (6 weeks, 3,6,9 and 12 months), and in two interactive situations. The interactions of mothers and infants were observed during free play at all time periods. The introduction of an environmental perturbation – novel toy play – at 6, 9 and 12 months, provided a unique contribution to the literature, as it enabled the exploration of naturally occurring patterns of dyadic interaction across two contexts that had ecological validity. To date, there is both a dearth of research on naturalistic patterns of touch in early interactions, and a lack of attention within the context of touch to manipulations within natural environments.

Contexts have proven vital to mediating the effects of touch, and touch displays in the laboratory (Jean, Stack, & Fogel, 2009; Mozskowski & Stack, 2007; Stack, 2001), and the present study provided convergent data for comparison with these studies.

It was anticipated that across age, there would be differences in the way mothers use touch to communicate with their infants during intimate interactive contexts and that different types of touch would be used by the mother and the infant in different durations as a function of context and time.

It was expected that across age and context, both affect and gaze in mothers and infants, would be sensitive to changes in the interactive context, and vary according to the type, location and duration of touch. The need to wed discrete aspects of touch

with broader constructs of interaction and communication is demanded in the literature (Weiss et al, 2001), and critically the current research contributed to the understanding of the links between multimodal features of early communication that include robust examination of the role of touch.

An overarching aim of the research, was to provide naturalistic data to the burgeoning literature of touch in early social interactions. Without much empirical guidance from the literature, the current research was both exploratory with reference to the use of touch as a modality of communication in naturalistic settings, and investigative of the utility of the environmental manipulation. Utilizing an observational design within a dynamic systems frame of reference two broad questions guided the research.

Firstly, does touch develop over time? This question, relates to the nature of how touch is expressed over the first 12 months of life with particular reference to both the mother and the child. In particular, this implicated infant maturation, dyadic change and changing contexts as vehicles for the development of touch, and the literature informing these tenets, while not yet integrated has been outlined.

The second question, guiding the investigation was does time change the nature as well as the amount of touch, and what are the implications for dyads. It has been suggested, that it is within dyadic change resides the innovations and variability of communication (Fogel & Garvey, 2007). Acceptance of this position, would suggest that changes in either the mother or the infant, would reference change in the dyad as the inextricable links of one to another are attenuated – a point that provides the empirical focus of the research.

CHAPTER 2. METHOD

Participants

Recruitment

Thirty-two healthy full term infants and their mothers were recruited from within the Canterbury Province, South Island, New Zealand. Advertisements were placed in neonatal wards of major community hospitals in the area, and in the rooms of General Practitioners, Midwife cooperatives and Parent Centre Education facilities. New mothers (both primiparous and multiparous) were asked to voluntarily contact the first author for an information sheet outlining the nature of the research prior to committing to the study (See Appendices). They were contacted by phone prior to six weeks post delivery as to their availability. Families were offered a copy of their video sessions in entirety for participating.

For separate reasons data from one age period for 2 of the dyads are missing because: the family shifted from the area before all data were collected (1) and difficulties contacting the mother to schedule videotaping (1).

All babies were born between thirty-seven and forty-two weeks gestational age and by maternal report had no major birth complications, chronic illnesses or identified disabilities. In terms of birth order the majority were first-born infants (N= 18), the next largest group second-born infants (N=11), with a small number third born (N=2) and fourth in the family (N=1). In the sample there were 17 female and 15 male infants.

Demographic Descriptions.

Mothers had a mean age of 33.84 years (*SD* =3.69*,* range 28 – 42).The majority of mothers who participated were of New Zealand European descent, 84.4%. The sample also included NZ Maori, 9.4%, Other Pacific Island, 3.1% and Other, 3.1% (Russian, Dutch). In terms of education no mothers were without high school education, 18.7% with high school education or trade qualification, and the majority had a tertiary qualification, 81.3%. While most mothers were married 71.9%, a further 25% reported being in a de facto relationship with the infant's father. One mother was parenting alone, and one mother separated from her partner during the course of the study. Father's education levels (as reported by the mother) showed no fathers were without high school education, that 31.2% with high school or trade education, but the majority had some form of tertiary education, 68.8%. Thus, the educational levels of the mothers were similar to the fathers in this sample.

All except one of the fathers were in full-time employment, and a number of mothers were in paid employment 65.7% with the bulk of these in part time employment (59.4%). For 71.9% of dyads earned $80,000 or under and 67.9% of infants spent 14 hours per week in care outside the home with 14 infants in child care centres. Only one of the infants was in full time care.

Research Design

In an attempt to document patterns of dyadic interactions over time and comment on differences in the development of touch within and between dyads, this study employed a longitudinal multiple-case design. Dyads were videotaped at five wave

points across the first year of life – six-weeks then three, six, nine and twelve months. Various commentators have attested to the utility of ongoing longitudinal designs for apprehending development over time (Jean, Stack & Fogel, 2009; Ferber, Feldman & Makhoul, 2008).

Procedure

Videotaping

Mother-infant dyads were videotaped in five waves between the ages of 6 weeks and 12 months. All sessions occurred in the context of the family's homes. Because the responsivity of both interactants was critical to the study it was a prerequisite of all taping sessions that the infant be alert. In order to achieve this, particularly for six week old and 3 month old infants, the researcher was in constant contact by phone with the mother. It was suggested to mothers that an optimal time for videotaping would be after the infant had been asleep and been fed. However given the difficulty predicting infants behaviour in the early weeks, particularly with reference to sleep patterns, at times the researcher had to reschedule a session or wait in the home until an appropriate alert state was achieved.

Pilot testing had revealed that naturally occurring interruptions in the home had the potential to compromise videotaping sessions. Specifically, telephone calls, visitors to the house, televisions on and sibling play were identified as detractors and it was requested that these effects be limited and/or restricted.

All dyads remained in the one family home for the duration of the study and the same room – usually the living room – was the environment chosen. Most were well lit

although there were subtle changes to the light accessed by the video camera, which was sensitive to time of day, outside weather, lighting in the house and position of objects in the room. Where possible, light was maximized prior to or as soon after taping had started as possible.

Previous research has indicated the utility of one video camera and a mirror to capture the early interaction patterns of mother and infant (Lavelli and Fogel, 2002; Moszkowski, Stack, & Chiarella, 2009, article in press), although data collection in this research began prior to these publications. Thus, one video camera was used (Canon, MV500i), and a mirror measuring 40cm X 1.1m was positioned behind each infant's head. In this way both the mother and infants faces were captured on tape as well as most of the mother's upper bodies. All data were digitally collected including time, date and video data in terms of minutes, seconds and parts of seconds.

Because the data was uniquely collected and coded, the videotaping procedure for each wave will be outlined separately.

Six-weeks

No restrictions were placed on the mother as to the positioning of her infant other than the necessary placement of the mirror. This was in part to facilitate the most favoured positions for each dyad of face-to-face play and to maintain an ecological distance i.e. because infant position was not an independent variable in this study as in Lavelli &

Fogel (2002), choice in infant positioning was seen as critical in supporting the emerging dyadic patterns without a priori assumption of appropriateness.

Mothers were asked to "interact with your infant as you normally would in face-to-face play". Further, mothers were asked to ignore the movement of the researcher who may at times move around the dyad (usually behind the mother). It was explained that this was most likely a case of improving the camera angle or positioning due to light. It was also indicated to mothers that if for any reason they wished to terminate the video session e.g. infant fussiness, the researcher would be happy to wait until a more appropriate time or that another session could be rescheduled.

Mothers were also told that at least 5minutes of interaction would be recorded and to continue to play naturally until the researcher indicated that the time was up.

The goal of these instructions was to maximize the observance of spontaneous interactive play while encouraging a context of informed choice for the mother. Studies where the researcher videos in the participants home vary in their reporting of the impact of the researcher as a third party.

3-months

The same procedure followed for infants and their mothers at 3 months. Again no restrictions were placed on positioning other than the face-to-face conditions and

mirror placement of the first wave of video data. Mothers were reminded that 10mins of video would be gathered at this wave and that the researcher would indicate when this time was up. The previous instructions relating to mothers interacting with their infants spontaneously, researcher position and the termination of the session were reiterated prior to taping. As with the previous wave, mother's use of objects was not restricted or specified.

Similar to the 6week data, the last 5mins of taping were used in data analysis, with the first 5mins considered time for the mother and child to become familiar with the presence of the researcher and the camera.

6, 9 and 12months

To continue the investigation into the co-regulated patterns of interactive patterns emerging for dyads at this age, and their sensitivity to changes that enact perturbations within the system, the effects of context on infant and maternal touch were explored. At 6, 9 and 12 months, mothers and their infants were videotaped for a minimum of 6 minutes in each of two different conditions. In Condition 1 (Free Play) the mother "interacted with the infant as she normally would in face-to-face play" with the mirror again strategically placed behind the mother so that both the mother's and the infant's face were simultaneously recorded.

Once the researcher had indicated to the mother that 6 minutes had been recorded, instructions for Condition 2 (Object Play) were given. A basket of toys was given to the mother and they were told that the basket included a small range of "toys appropriate for the infants age". These toys were standardized for each dyad and were

carefully chosen for their age appropriateness and their uniqueness. Whilst it was impossible to predict whether any one dyad may have had access to the items before, maternal report indicated that most items (not their function e.g. rattle, push-to-touch music toy) were new to the dyads. The toys offered at 6 months remained in the basket at 9 and 12 months, and those added at 9 months remained in the basket at 12 months. A number of new items were added at 12 months.

The rationale for this was there was a reasonable expectation that not all toys would have been played with at earlier waves and encounters with novel toys for 6mins 3 months previously given the infants ages were likely to retain novel interest. More importantly it was expected that given the intermittent opportunity to engage with the materials it was possible that new and novel forms of play could be generated with the same materials.

Further, it was explained that there were no expectations as to how the toys would be used or that every toy available had to be used. Mothers were then invited to play with their infants for a further 10mins using the toys in the basket.

Immediately following any clarification of instructions Taping of Condition 2 – Object Play - began when the mothers' first touched the basket of toys.

The introduction of "age appropriate toys" (perturbation) was designed to inject novelty into the environment. Recent research has highlighted the importance of "ordinary variability" within communicative patterns as well as the emergence of innovative forms embedded within a history of lived experiences (Fogel and Garvey, 2007). Whilst these authors suggest that these patterns of change are best explored using a microgenetic design, implicit in their suggestions is the significance of apprehending not only the interactive history of the dyad but embedding it in a

concept of “alive communication” (Fogel & Garvey, 2007, p251). A process of communicative change that is not static or distinguishable by discrete acts but rather a “co-regulated” journey of experiences by the dyad. It was anticipated that by changing the environment – both by providing the mother with toys that were described as developmentally appropriate i.e. raised expectations as to their infants play, and providing opportunities for the negotiation of novel communicative actions around unfamiliar objects – that a comparison of interaction in each condition would provide insight into dyadic developmental change.

The last 5 minutes of Condition 1 and the first 5 mins of Condition 2 were extracted for data analyses. The rationale was that enough time would have elapsed in Condition 1 for normally occurring interactions to occur after taping had started, and it was anticipated that the first minutes of Condition 2 would reveal co-regulatory responses of the dyad to novelty.

Measures

Questionaire

At 12 months all mothers completed the ITSEA (Infant Toddler Social Emotional Assessment, Carter & Brooks-Gunn, 1999). The ITSEA is a 169 item, 3-point self-report questionnaire which groups questions into domains of social-emotional functioning – Externalising, Internalising, Dysregulation and Competence. It provides composite scores of subscales relating to each domain and is designed to be developmentally sensitive to changing social-emotional and behavioural issues in young children. Although without national norms and clarity around who comprised

the normative sample (Guess, 2008) , This instrument has been tested against other forms of social emotional assessment, is easy to read, takes a short time to complete and can be scored by hand. It has test-retest reliability, had been validated in several studies and has been identified as a useful screen for intervention.

It was expected that this measure act as a socioemotional screen for information that would directly relate to any vulnerabilities of the infants.

Behavioural Coding

Because dyads acted as their own controls over time, one of the goals of the research was to document the trajectories of face-to-face interactions and touch across the first year of life. This provided both within and between subject (dyad) comparisons of dyadic communication and meant that the same behavioural indices could be repeated across waves for direct comparison. Tracking inter and intra dyad differences would add to the growing research on the development of touch over time and the imperative of some authors to establish a "tactile lexicon" (Muir, 2002, p1) or a language of touch that transcends discrete behaviours and explores processes underlying development. This imperative calls for attention beyond maternal touch patterns, or the exploratory functions of infant touch to dyadic communication as the locus for the development of "infant productive vocabulary" (Muir, 2002 p2).

A number of unpublished and published coding schedules pertaining to maternal and infant touch exist, and authors have used these variously to investigate the exploratory functions of infant touch and/or focused on maternal touch as a vehicle of developmental change. Fewer still have explored both qualitative and quantitative

aspects of infant touch behaviour within the context of mother-infant interactions with most using variations on the Still-Face Paradigm in the design (Moszkowski & Stack, 2007). However, implicit in this burgeoning literature in the increasing emphasis on the expression of touch embedded in intimate parent-child as a vehicle for describing developmental norms and a language of touch in early life.

Thus a coding system was required that captured the development of touch in dyads within a context of spontaneous communication. In addition, the coding schedule needed to apprehend elements of touch within face-to-face interactions to be sensitive to both qualitative and quantitative features of touch. In other words coding behaviours, to use DS terminology, as they were "assembled online" (Thelen & Smith, 1994).

To achieve this goal the relative effectiveness of other coding schedules in relation to the hypotheses of this study were examined. In particular the utlility of the Infant Touch Scale (Moszkowski & Stack, 2007), Tactile Interaction Index (Weiss, 1992), Quality of Parent-To-Infant Touch Protocol (Goldyn & Moreno, 2002), The Maternal Touch Scale (Beebe et al 2007) and the Face-to-Face Touch Coding System (Koester, 2000), considered pertinent to this longitudinal research were examined. The latter was chosen as it emphasized different modes of touch, such as passive and active, the types of touch e.g. pat, rub, kiss, the location of the touch and the intensity of touch. It also characterized critical features of face-to-face interactions that were simultaneously expressed, importantly gaze and affect. Further, it was considered that all categories of the schedule, could be applied to both the mother and the infant. Given the age of the infants in the earliest waves, maternal touch was examined using an adapted version of the Face-To-Face Touch Coding System (with permission: personal communication 2009).

Coding Procedures

Coding of video data was conducted using the coding system VCode/Vdata (see Appendices). This computerized system, was designed by members of the Social Research Group of the University of Illinois (Joshua Hailpern, Joey Hagedorn, and Karrie Karahalios, 2007). This system provides the researcher with opportunities to simultaneously capture a variety of data types through multiple annotations. This means it was possible to annotate an array of events and using the "Comments" feature, attach additional observational data to the events without interrupting the timeline. Of particular importance was the facility to simultaneously code both ranged and momentary events. This meant that both discrete data and event sampling could be applied to the data. This flexibility was critical for the types of analyses required at each wave and the inbuilt facility for reliability calculations in VData.

Extensive viewing of video data revealed common recurring patterns of touch between mothers and infants, which could be captured as "Touch Frames". It was decided that the identification and subsequent analysis of these would contribute to the overall patterns of touch within dyads, and add to the research exploring the role of touch in emotional development in early life. The inseparability of the experiences of touching and being touched i.e. it is impossible to touch another without being touched yourself, suggests that both infant and maternal variables were critical inclusions in analyses. In addition at approximately 6months of age infants are said to have assembled a range of communicative and digital exploratory skills to enable them to have some autonomous control over environmental events (Rochat, 2004).

In addition, visual attention within the dyad i.e. the patterns of mutual gaze or "gaze-at-other" by one member of the dyad were seen as crucial to establishing baseline data

of what has been eloquently termed “the importance of seeing and being seen” within relationships (Wilson, 2007, pp107). Gaze is an early tool that an infant has in its array of attention getting and maintaining skills and is closely linked to parent-infant synchrony (Feldman & Eidelman, 2007).

Similarly the role of affect in establishing the regulatory and expressive capacities within dyads has been reported (Weinberg, Tronick, Cohn & Olson, 1999), and is linked to dyadic coordination (Moore & Calkins, 2004), and is differentially affected by environmental stimuli (Weinberg & Tronick, 1994).

Moreover, the scarcity of studies examining touch within an array of co-ocurring communicative modalities has been documented (Muir, 2002), and one of the objectives of this study is to explore how touch is used in combination with gaze and affect as contributors of dyadic communication.

Six weeks and 3 months – coding

To this end, the first 5mins (6weeks) and last 5mins (3months) of the video data for each dyad were chosen for coding procedures, (the first 2mins and 5mins respectively were considered time for the mother to become accustomed to the presence of the researcher and the camera) and were not used in the analyses.

Each second of video was coded according to the coding protocols and coded on the last frame of each second using the momentary or marking procedure on VCode. We coded gaze behaviour - maternal and infant, and maternal and infant touch – type, location and intensity, and affect.

The complete set of coding protocols and instructions are outlined in Appendix 3. *Infant Gaze:* gaze at mothers face, gaze at mother's body, gaze at object, gaze aversion. *Maternal Gaze:* gaze at infant, gaze at infants body, gaze at object, gaze aversion. An uncodable category was added for maternal and infant gaze in the event that due to camera angle or body positioning the face of the mother, or the infant was obscured for more than fifty percent of the second.

In addition each second was coded for touch by the mother according to the following: *Maternal touch:* no touch, functional touch, affectionate touch, static touch, and stimulatory touch. As well as type of touch the location of the touch was coded: *Location of Touch:* head/face/neck, arms/hands, torso/body, feet/legs. The *Intensity of Touch* was coded along two dimensions: gentle/moderate and moderate/forceful. Coding of these measure required three separate passes through, with a further pass through to isolate location and intensity of touch.

6, 9 and 12 months

Data coding at 6 months, 9 months and 12 months sought to elucidate patterns of touch of the dyad using microanalysis. Authors have successfully used microanalytic techniques to track patterns of face-to-face communication in the early weeks of life (Lavelli & Fogel, 2002), the subject matter of dyadic play (Kendon, 1985) and acts of mutual engagement (Bateson, 1975).

Therefore it was important in this study to track the communicative qualities of **both mother and the infant initiated behaviour in the same categories:** *Touch (Location*

– head/face/neck, torso, arms/hands, feet/legs; *Type of Touch* – passive, active-stimulatory, active-soothe, active/passive, movement - *and Intensity of Touch* – gentle/moderate, moderate/forceful*)*, *Gaze (*looking at other face, looking at other body, looking at object, gaze averted, uncodable) and *Affect* – neutral, smile, negative).

Behaviours across all waves, were coded by the current author, and an independent rater (undergraduate student), blind to the hypotheses of the research. A third rater (undergraduate student) recoded approximately 15% of randomly selected data to assess inter-rater reliability. Both raters were trained by this researcher, using videotape examples prior to coding the data set, until a high level of reliability was achieved. Reliability was established using Kappa coefficients averaged 89% for 38 five minute tapes, *kappa* = .83, (range = .72 - .96).

Data Analyses:

In an effort to track development over time, following descriptive statistics, a planned series of repeated measures ANOVA were designed to explore changes in all variables across the first year and across condition. Repeated measures ANOVA (RMA) have been used extensively by researchers in the field of touch, to examine the potential mean level changes in the types and locations of touch, and other variables such as the functions of touch, gaze and affect (Moszkowski et al, 2009). By using RMA, it was possible in the current research to track the trajectory of each type of touch, the location of touch, while tracking the affect and gaze patterns *concurrently*. Whilst the observation points are non-independent, strict adherence to the issues around sphericity in particular, were important features of the analyses.

After tracking overall touch (the dependent variable), as an overarching measure of the touch patterns in dyad, further RMA analyses sought to track all the variables over time and across context, to build a more complex picture of the interrelatedness of the features of the interactions. As part of the analyses, demographic variables including gender, age, maternal age, socio-economic status, were entered as predictor variables to examine how each might influence the outcomes of the amount of touch used by mother, the types of touch used by mothers at various time points and across condition, and the impact of each on the patterns of gaze and affect that emerge.

In addition growth curve modeling was used to explore the trends in the data over time and then provide a fit for successive models using demographic data as predictors of overall touch patterns. Whilst PASW is not a specialist software package for conducting these analyses, the advantage of engaging with linear mixed models is that their strength lies in apprehending nesting data. Data from the current thesis are nested data – touch is nested within individuals, which is in turn nested in dyads. Multilevel models are a way of completing regressions analyses on repeated measures data that have hierarchy. The implications for predictive patterns are clear and provide opportunities for exploring individual differences.

CHAPTER 3. RESULTS

Preliminary Analyses

The data obtained for the types, locations and overall touch patterns, and accompanying affect and intensity levels were reduced to obtain percent duration of the variables for each five minute time period. Percent duration was calculated as the percentage of time mothers/infants touched the other within each 300-second period.

Descriptive statistics were conducted to screen the raw data for the presence of outliers, skewness and kurtosis and to confirm the normality of the distribution of all variables. Observation of frequency data, including histograms, box and stem and leaf plots for Overall Touch (combined total percent duration of each type of touch) at each free play time period, and Kolmogorov-Smirov and Shapiro-Wilk tests of normality indicated that the data were significantly non-normal and were highly positively skewed. The K-S tests were significant for Overall Touch at 6weeks ($D(34) = 0.47$, $p<.05$), 3months ($D(34) = 0.45$, $p<.05$), 6 months ($D(34) = 0.41$, $p<.05$), 9 months ($D(34) = 0.36$, $p<.05$) and 12 months ($D(34) = 0.37$, $p<.05$). Similarly the Shapiro-Wilk tests indicated a significant deviation from normality at 6weeks ($D(34)$, 0.24, $p<.05$), 3months ($D(34) =0.24$, $p<.05$), 6 months ($D(34) = 0.27$, $p<.05$), 9 months ($D(34) = 0.31$, $p<.05$), and 12 months ($D(34) = 0.34$, $p<.05$).

As a result of these findings, to correct for the distributional issues and the presence of outliers it was decided that transformations on the data would be conducted. Because data between several variables were to be compared over time it was necessary to transform all variables. This was because transformations, while not altering "the relationship between variables…it does change the differences between

different variables because it changes the units of measurement" (Field, 2005, p79). In addition, transforming data is a preferred option for positively skewed data.

To this end, variables were transformed using the natural logarithm each set of scores for each dyad at each time period. In addition, because some scores in the data were zero, a constant of 1 was added to the computation. This meant a log (X*i* +1) was applied to all of the data prior to further analyses.

The resulting transformed data were not significantly different from normal. In addition, violations of sphericity (Mauchly's test) were seldom recorded and tests of homogeneity of variance (Levene's tests) were largely non-significant. These all point to a transformed data set that approximated normal distributions, showed equality of variance between the differences in scores across and within age groups. Any violations of sphericity were corrected using Greenhouse-Geisser estimates and are reported in the findings where significance was found and this correction made.

For clarity raw mean percent duration tables of overall touching for mother and infant are reported in Table 1.

Table 1. Overall mean percent duration of maternal touching across the first year of life

Infant age in weeks	6	12	24	36	48
Overall mean	190.60	162.87	84.93	22.34	16.88
SD	532.38	454.93	238.44	63.58	49.03

To further aid comprehension it is important to state that due to the fact that no restrictions were placed on mothers to adopt a particular position to interact with their babies, 15 of the 32 (46.87%) were held in an en face position (lying on the mothers legs facing her) for the entire filming session at age 6 weeks, 9 out of the 32 (28.13%) did not hold their babies at any stage, and the remaining 8 (25%) used a combination of holding and not holding. By 12 weeks these numbers had changed dramatically so that 18 mothers of the 32 (56.25%) used a combination of holding and not holding the baby, while 25% (8) were not held at all and the other 18.75% (6) were held. From 6 months of age the majority of babies were not held in an en face position and instead mothers held them in a sitting position by holding one foot, supporting their back or using intermittent "catching" (grabbing an arm or supporting the back) when necessary. Thus at 6 weeks it was possible for some babies to be fully supported in supine with the mothers hands free to touch other parts of their bodies with one or both hands, or other parts of their bodies (e.g. lips). This situation meant that outside the mutual exclusivity of the coding system it was possible to code both a particular type of passive (whole body supportive) touching and other forms of touch because they *co-occurred* in the same second. To deny this situation would have been to ignore the lived experience of the dyad and ignore the patterns of touching the infants experienced. Thus the mean percent duration particularly at 6 weeks for approximately 72% (23 out of 32) of the infants could exceed 100%. Six weeks later this was reversed – over 50% of babies were positioned in alternating held and not held positions and 25 % (8 infants) were not held at all. Thus 81.25% (26 infants) experienced periods of not being held. However calculations were carried out on the data *without* the passive supportive category and revealed that mothers touched their infants for an average of 42.67% (*SE* = 91.30), at 6 weeks, 30.4% (*SE* = 78.02) at 12

weeks and 21.84% (*SE* = 40.89) of the time at 24 weeks. By 36 weeks and 48 weeks respectively the percentage of touching had dropped to 5% *(SE* =1.95) and 4.47% (*SE* = 3.75). These results need to be interpreted in light of two facts. Firstly that both toy conditions at 36 and 48 weeks resulted in half of the mothers (16) not touching their infants at all and secondly the high variability in duration percentages, particularly early in the first year. Whilst these results can be seen as an artifact of the size of the sample and as such associated with reduced power, it is important to remember that these findings were reliably coded observations and the only environmental manipulation was the introduction of novel toys. Further, mothers were not informed that touch specifically would be measured, rather a general statement was made regarding the measurement of mother-infant interactions. This was to ensure mothers interacted as naturalistically as possible, thus ensuring that whatever patterns emerged were the result of undirected attention to specific aspects of dyadic play. The discussion section will address these features of the data more fully with particular reference to developmental implications of mutuality and the changes in the communicative array that mothers and infants use over time. Changes in touch patterns must not be viewed in isolation from other modalities of communication, including changes in gaze and affect that were measured here. Attention to these, particularly in the second half of the first year is warranted, in light of the overall touch data.

Following the transformation procedures repeated measures analyses of variance were conducted for each dependent measure, that were within subject factors. Planned comparisons were part of the analyses to locate the source of interaction effects and Bonferroni corrections were applied to reduce the occurrence of Type I errors.

Further, where significance is reported partial eta-squared estimates (η_p^2) are reported as measures of effect size. Partial eta squared is generated as a measure of effect size by PASW18, as part of GLM Repeated Measures output. Although eta-squared is defined in the PASW18 manual, what is actually reported is (η_p^2). This has led some authors to criticize the reporting of these because "obtaining estimates of the eta squared from SPSS (PASW) [authors] are at risk of reporting incorrect values" (Levine and Hullett, 2002). According to others (η_p^2) "is not a measure of unique variation in the dependent variable in that some of the non-error variation can be accounted for by other factors in the analysis" (Pierce, Block & Aguinas, 2004, p 919). However, recent studies in this area have reported (η_p^2) as measures of effect size (Ferber, et al, 2008, Jean, Stack & Fogel, 2009) and are supported by attention to the influence of research design and comparability issues (Olejnik & Algina, 2003). According to Keppel and Wickens (2004) effects sizes, based on Cohn's *d* suggest that a small effect size is 0.2, a medium effect size is 0.5, and a large effect size is 0.8. Effect sizes for this study fell mainly in the medium to large effect size range.

Initial analyses included gender as a between subjects factor. As no main effects or interactions were identified the decision was made to collapse all subsequent analyses across this variable. In addition demographic variables were entered as between subject factors – age of mother, family income, child-care hours – and none were found to have a significant effect on overall maternal touch. An interaction between mother age and child care hours were the only variable to approach significance and so all further analyses were collapsed across demographic variables also.

Part 1: Developmental patterns in mother-child interaction across the first year

1: <u>Maternal touch</u>

1.1 Overall touch

The first set of analyses set out to examine the patterns of touch expressed by mothers by comparing the amount of touching behaviour during free play at each of the five time periods. The percent duration calculated for all forms of touch were combined to form an overall percent duration for each observation period and the developmental trajectory used as the dependent variable in the repeated measures ANOVA that were conducted.

A one-way repeated measures ANOVA using overall touch as the dependent variable to investigate the duration of maternal touching during social interactions revealed a decrease in overall maternal touch across the first year. This finding is shown in Table 2, which contains the overall means, SD's, *F* values and effect sizes for all five age groups. The results show that the amount of maternal touch was significantly affected by the age of the child F (4, 132) = 50.18, $p < .05$, $\eta_p^2 = 0.60$, indicating that as the age of the child increased the amount of maternal touching decreased significantly.

Planned contrasts showed that a significant decrease in overall touch was observed between the consecutive age points of 12 weeks and 24 weeks, F (1,33) = 14.74, $p < .05$, $\eta_p^2 = 0.31$, and 24 and 36 weeks, F (1,33) = 21.32, $p < .05$, $\eta_p^2 = 0.39$. Post-hoc comparisons revealed significant mean level differences between all age points except between 6 and 12 weeks, and 36 and 48 weeks. These data suggest that mothers reduced their touching at each consecutive age point but that the most significant reductions were recorded in the middle of the first year transitioning across 24 weeks

or when the infant was 6 months of age. These differences are depicted in Figure 1, and show the decrease in overall touch based on estimated marginal means at each time point.

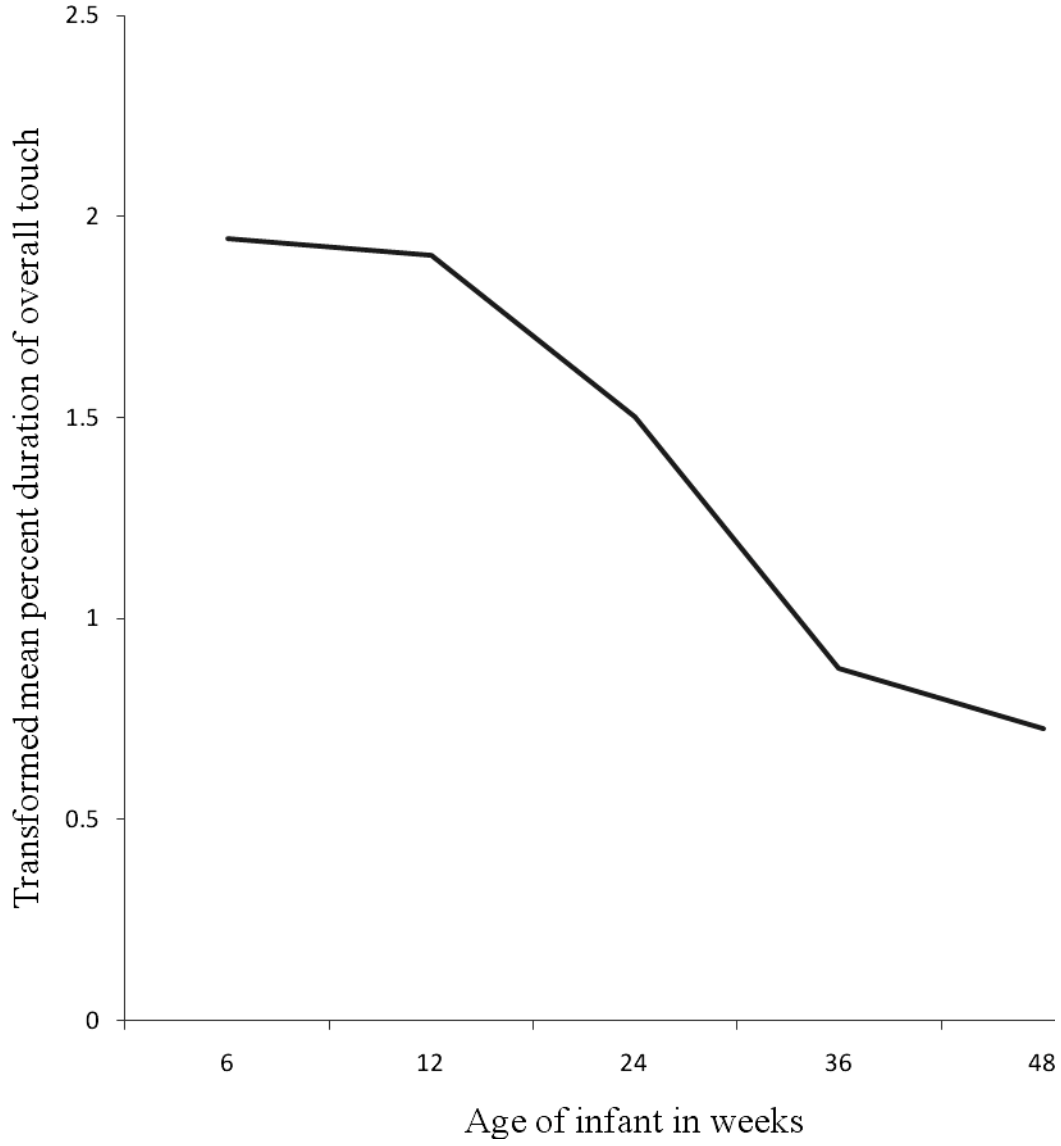

Figure 1 Transformed mean percent duration of overall maternal touch in mother-infant free play across the first year of life

1.2*:* Type of touch

The results from the coding of five types of touch were examined, and given the low frequencies particularly for the active/passive category, the decision was made to combine the categories to form two major forms of touching – active and passive – which seemed to persist with reference to activity. Both passive and active elements were part of the original coding schedule so the combination of passive, active/passive and active soothe, and the combination of movement and active stimulatory touching reflect both the quality and the activity level of the touching.

To examine how these two aggregated categories varied across the first year of life a 5 x 2 (Age x Type of touch) repeated measures ANOVA using the transformations of the mean percent duration data as the dependent variable. Results revealed a significant main effect for age F (4, 124) = 47.61, $p < .05$, $\eta_p^2 = 0.89$, a significant main effect for Type of touch F (1, 31) = 18.68, $p < .05$, $\eta_p^2 = 0.37$, and a significant interaction between Type of touch and Age F (4, 124), = 2.51, $\eta_p^2 = 0.61$. Consistent with earlier findings both types of touch decreased over the first year and contrasts confirmed a significant decrease at consecutive time points of 12 and 24 weeks, and 24 and 36 weeks: F (1, 31) = 17.24, $p < .05$, $\eta_p^2 = 0.35$, and F (1, 31) = 19.55, η_p^2 =0.41 , respectively.

Figure 2 illustrates the types of touching the mothers were using while interacting with their infants. Passive touching remained above active touching for all time points except for time 4 (36 weeks). Post-hoc comparisons revealed collapsed across age, mean level differences were significant between passive touch (M = 1.17, SE = .07) and active touch (M = .94, SE .067). These data indicate that mothers were more

likely to interact with their infants using passive forms of touch compared with more active touch patterns.

In addition to these findings the ANOVA revealed a significant interaction between age level and type of touch, F (4,124) = 2.5, $p < .05$, $\eta_p^2 = 0.075$. However as Figure 2 shows only duration values at 36 weeks contribute to this finding and contrasts confirms the only significant difference for the types of touch was between ages 24 weeks and 36 weeks. F (1,31) = 5.57, $p < .05$. The significance level for the interaction was .045, with a small F value and small effect size value, means cautious interpretation of this finding is warranted.

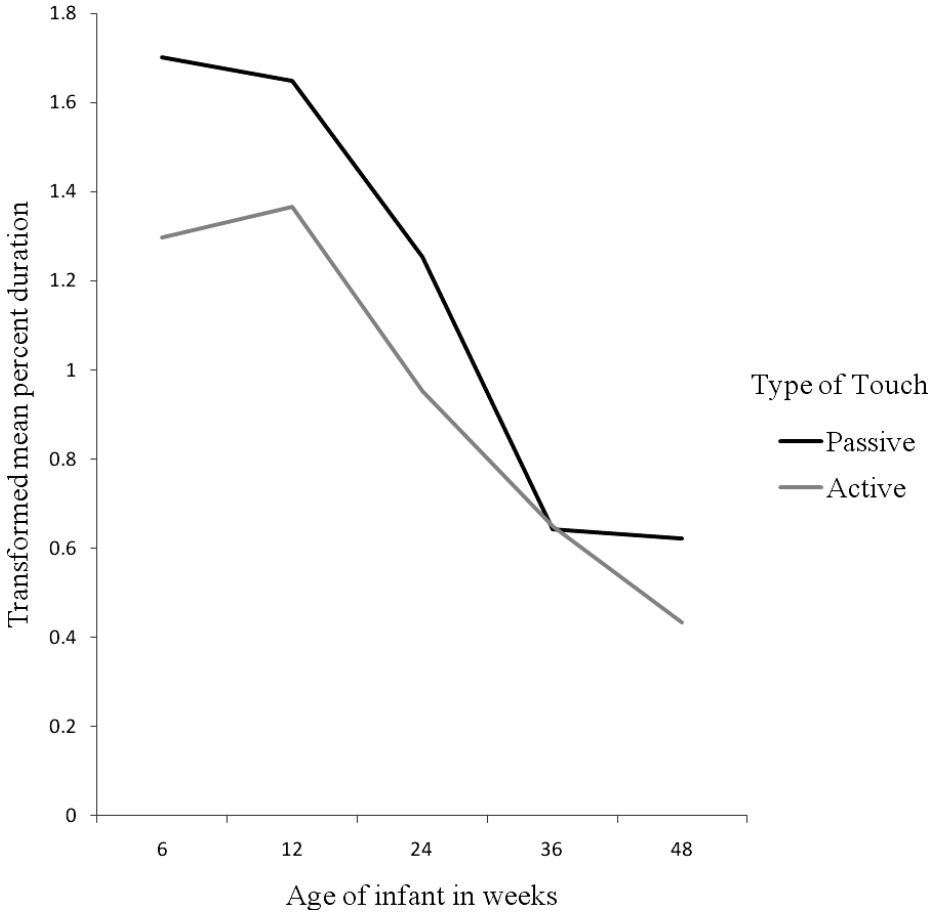

Figure 2. Transformed mean percent duration of overall passive and active maternal touch in mother-infant free play across the first year

1.3 Locations of touch

The next set of analyses focused on where on the infant's body these touches occurred. In order to investigate if there were any differences in where mothers touched their infants during free play interactions, a 5 x 4 (age x location) repeated measures ANOVA was conducted. Results revealed a significant main effect for age F (4, 124) = 31.23, $p < .05$, $\eta_p^2 = 0.50$, and location F (3, 93) = 84.26, $p < .05$, $\eta_p^2 = 0.73$. Figure 3 indicates that mothers spent more time touching their infants on their torso than any other location at any time period and that this location showed stability across the first 3 time periods of 6, 12 and 24 weeks (Transformed mean percent durations were: M = 1.25, 1.22, and 1.23 respectively). Mothers also spent more time touching their infant's arms than their feet or head. This is depicted in Figure 3 and is also reflected in higher mean percent durations at each time point (Transformed mean percent durations were M = 0.59, 1.01, 0.81, 0.30, and 0.19 respectively). In addition it is clear from Figure 3 that at by the end of the first year (12 months at time point 5), mean percent duration of maternal touching of arms, feet and head converge and show similar means (Transformed mean percent durations: M = 0.19, .016, and .014 respectively. Figure 3 points to increases in maternal touching of arms and head between 6 and 12 weeks, and increases in touching infant's feet between 12 and 24 weeks. An increase in head touching between 36 and 48 weeks is evident.

Within-subject contrasts revealed that collapsed across location that there was a significant difference between the consecutive ages of 6 and 12 weeks F (1, 31) = 6.16, $p < .05$, $\eta_p^2 = 0.17$, and 24 weeks and 36 weeks F (1, 31) = 33.54, $p < .05$, $\eta_p^2 = 0.52$. This indicates that age had an impact on both the duration and location of maternal touching.

To explore these findings further, post hoc comparisons revealed non-significant mean level differences between the first three time points, however significant mean level differences between, 6 weeks (M = 0.67, SE = .07), 12 weeks (M = 0.81, SE = 0.06), 24 weeks (M = 0.78, SE = 0.08), and 36 weeks (M = 0.34, SE = 0.06) and 48 weeks (M = 0.29, SE = 0.05) were found. These data suggest that collapsed across different locations, age appears to influence the location of touching more in the second half of the first year. However planned comparisons of the mean level differences of the four locations confirm that significant differences existed. Mothers were more likely to touch their infants on some part of their torso across all ages (M = 1.02, SE = 0.07) than head, feet or arms (M = 0.35, SE = 0.05; M = 0.37, SE = 0.06; M = 0.58, SE = 0.06 respectively). Mean level differences were also significant for arms compared with feet and head. There was a non-significant pair-wise comparison between the locations of head and feet. Taken together these findings suggest that mothers direct their touching to their infant's torso and arms and that this is variable over the first six months of life. Coupled with the decrease in overall touch over the first year this suggests that age impacts where and for how long the mother touches the infant.

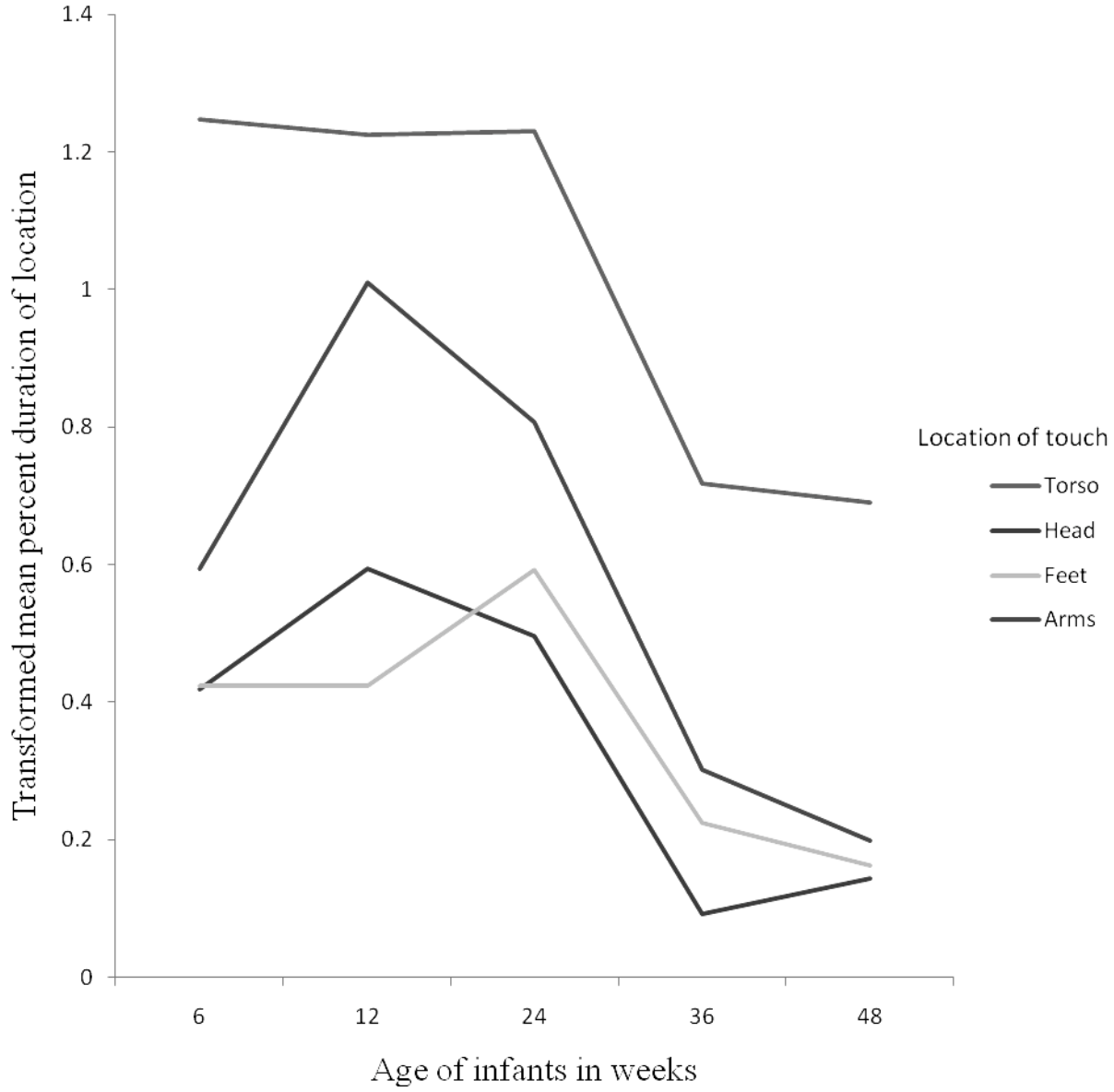

Figure 3. Transformed mean percent duration of locations of maternal touch in mother-infant free play across the first year

1.4 Maternal Gaze Patterns

The next set of analyses focused on vital non-verbal elements of interactions during free play between the mother and the infant to highlight patterns of gaze and eye direction. Specifically four gaze locations – face, body, object and avert – were examined through ANOVA to explore changes or stability in these patterns over the first year. Again, the free play interactions were the target data.

A 5 x 4 (Age x gaze) repeated measures ANOVA was conducted to explore the effect of infant age on maternal gaze. Results indicated a significant effect for age F (4, 124) = 32.86, $p < .05$, $\eta_p^2 = 0.52$, and gaze $F(3.93) = 273.79$, $p < .05$, $\eta_p^2 = 0.89$. In addition results show an interaction between Age and Gaze F (12, 372) = 20.76, $p < .05$, $= \eta_p^2$ 0.40. These data indicate that differences were found in the gaze behaviour of the mother depending on the age of the child. In other words age had a differential effect on where the mother directed her gaze during face-to-face interactions with her infant.

Figure 4 illustrates that mothers spent more time looking at the infant's face (M = 1.77, SE = 0.05) than the infant's body, or an object or averting her gaze (M = 0.99, SE = 0.59; M = 0.06, SE = 0.07; M = 0.47, SE = 0.06 respectively). Results also indicate that there was an increase in gaze at the infant's body and object introduced into interactions (free play) at each time point, with a concurrent decrease in gaze at the infant's face. Gaze aversion showed a relatively stable curvilinear pattern over the five ages (Ms = 0.39, 0.49, 0.39, 0.46, 0.57 respectively).

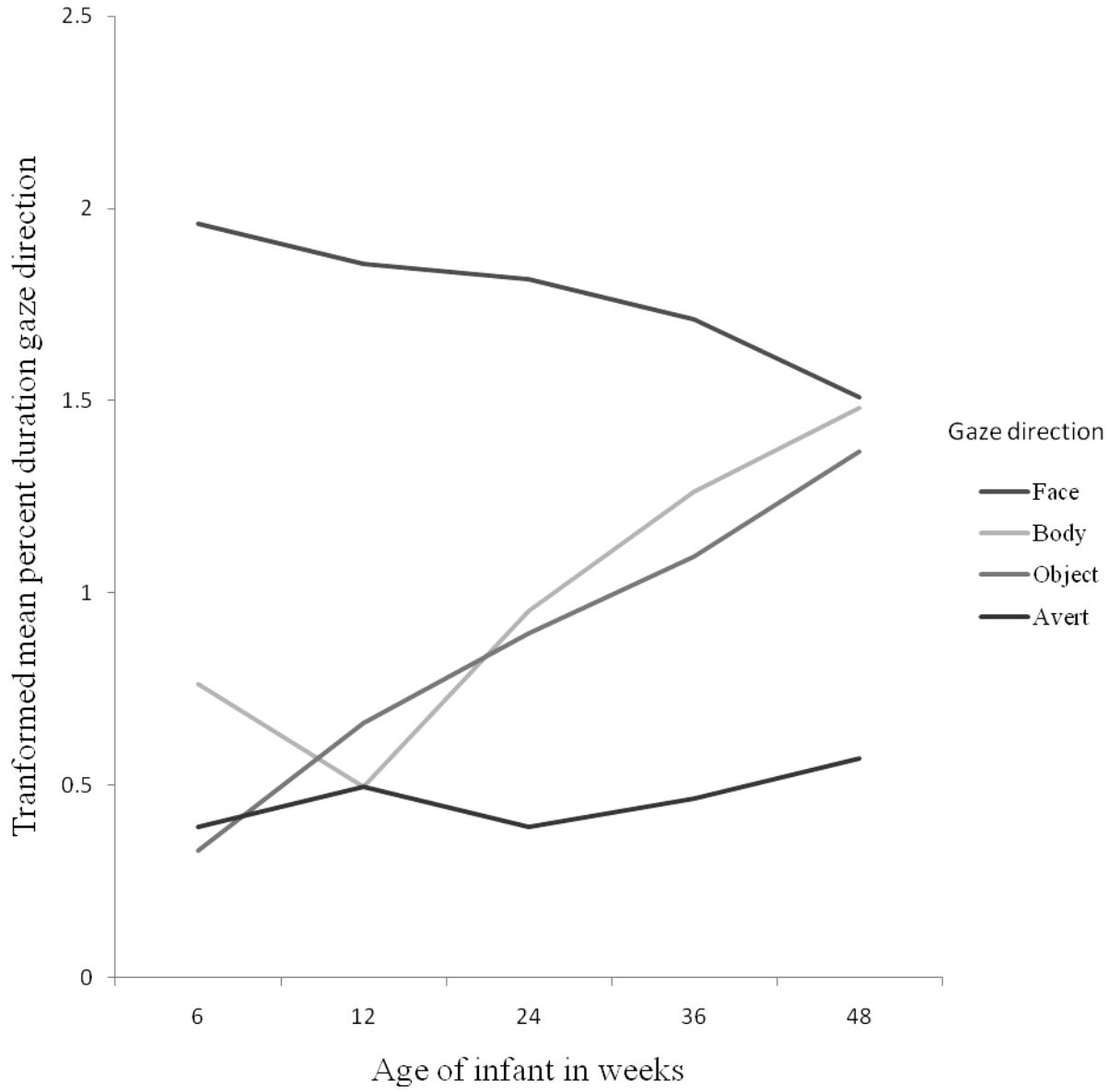

Figure 4 Transformed mean percent duration of maternal gaze direction in mother-infant free play across the first year of life.

To further investigate the nature of these findings, within subject contrasts showed that collapsed across type of gaze there were significant differences between the consecutive age periods of 12 weeks and 24 weeks F (1,31) = 10.56, $p < .05$, η_p^2 = 0.25, 24 weeks and 36 weeks F (1,31) = 8.53, $p < .05$, η_p^2 = 0.22, and 36 weeks and 48 weeks F (1, 31) = 9.58, $p < .05$, η_p^2 = 0.24.

When the data from the planned post hoc comparisons were examined, results indicated that significant mean level differences existed between gaze at face (M = 1.77, SE = 0.05) and all other types of gaze – body (M = .99, SE = 0.06), object (M = 0.87, SE = 0.07), and avert (M = 0.46, SE = 0.06). Further, the pair wise comparisons of estimated marginal means for maternal gaze at body and object were non-significant suggesting similar patterns of increase and variability across the first year.

With respect to mean level comparisons between each age point using estimated marginal means adjusted for multiple comparisons, there were significant differences between 48 weeks (M = 1.23, SE = 0.05) data and every other time point – 6, 12 24, and 36 weeks (M = 0.86, SE = 0.064; M = 0.88, SE = 0.058; M = 1.01, SE = 0.063; M = 1.13, SE = 0.056 respectively). Non-significant pair wise comparisons were revealed between 6 and 12 weeks, 6 and 24 weeks and 24 and 36 weeks.

Taken together these findings indicate that mothers use a variety of gaze behaviour during interactions with their infants, and that age and type of gaze interact to suggest that mothers adjust their pattern of gaze over the course of the infants first year. Maternal gaze at the infant's face at 6 weeks produced the highest mean percent duration of all age points, and despite a gradual decrease had the highest mean percent duration at all subsequent ages. Convergence of other forms of gaze – at the infant's body and at an object by 48 weeks – was another feature of the data.

The implications for variety and change in gaze behaviour with accompanying changes in the type and location of touch behaviour will be synthesized in the Discussion Section with respect to developmental change and stability.

1.5 Affect – Smile, Neutral, Negative

The final set of analyses in this section focused on maternal affectual changes across the first year as indicated by the change in facial expressions. According to the coding schedule, maternal smiles as well as neutral and negative facial expressions were coded in the free play condition.

A 5 x 4 (Age x Affect) repeated measures ANOVA was conducted to explore the mean percent duration of each expression. Results revealed a significant main effect for affect type F (2,62) = 139.74, $p < .05$, $\eta_p^2 = .98$, and a significant interaction between affect and age F (8, 248) = 6.08, $p < .05$, $\eta_p^2 = .16$. No main effect was shown for age indicating that collapsed across affect type there were similar durations across dyads at each age. Mean level comparisons confirm this finding – means at 6, 12, 24, 36 and 48 weeks were $M = 1.05$, $SE = 0.05$, $M = 1.04$, $SE = 0.049$, $M = 1.10$, $SE = 0.046$, $M = 1.06$, $SE = 0.036$, $M = 1.02$, $SE = 0.039$ respectively.

Tests of within subject contrasts revealed significant differences between neutral gaze and smiling F (1, 31) = 81.46. $p < .05$, $\eta_p^2 = .73$, and smiling and negative affect F (1, 31) = 159.43, $p < .05$, $\eta_p^2 = 0.98$. While contrasts of repeated measures cannot provide all comparisons for these type of data, they do indicate significant differences in affectual expressions across dyads. Contrasts also revealed a significant interaction between age and affect between 12 and 24 weeks F (1, 31) = 4.85, $p < .05$, $\eta_p^2 = 0.14$, 24 weeks and 36 weeks F (1, 31) = 8.18, $p < .05$, $\eta_p^2 = 0.21$, and 36 and 48 weeks F (1, 31) = 11.92, $p < .05$, $\eta_p^2 = 0.28$. These data indicate that that age (after 12 weeks) had an impact on the percent duration of neutral and smiling affect. In addition, each level contrast showed an increase in effect size over time.

Mean level comparisons of affect type showed a significant difference between all affect collapsed across age. Mother used more neutral affect when interacting with their infants across the first year in free play and this was significantly different to the use of smiling and negative facial expressions. The transformed mean for neutral affect was (M = 1.75, SE = 0.028), the mean for smile was (M = 1.39, SE = 0.034) and the mean for negative affect was (M = 0.025, SE = 0.01). The very low percent duration for negative affect in this study was often expressed as negative imitation of infant negative affect, rather than initiated negative affect. That mother's used more neutral affect than smiling to communicate with their infants and the implication for this across the first year will be discussed in light of decreasing overall touch.

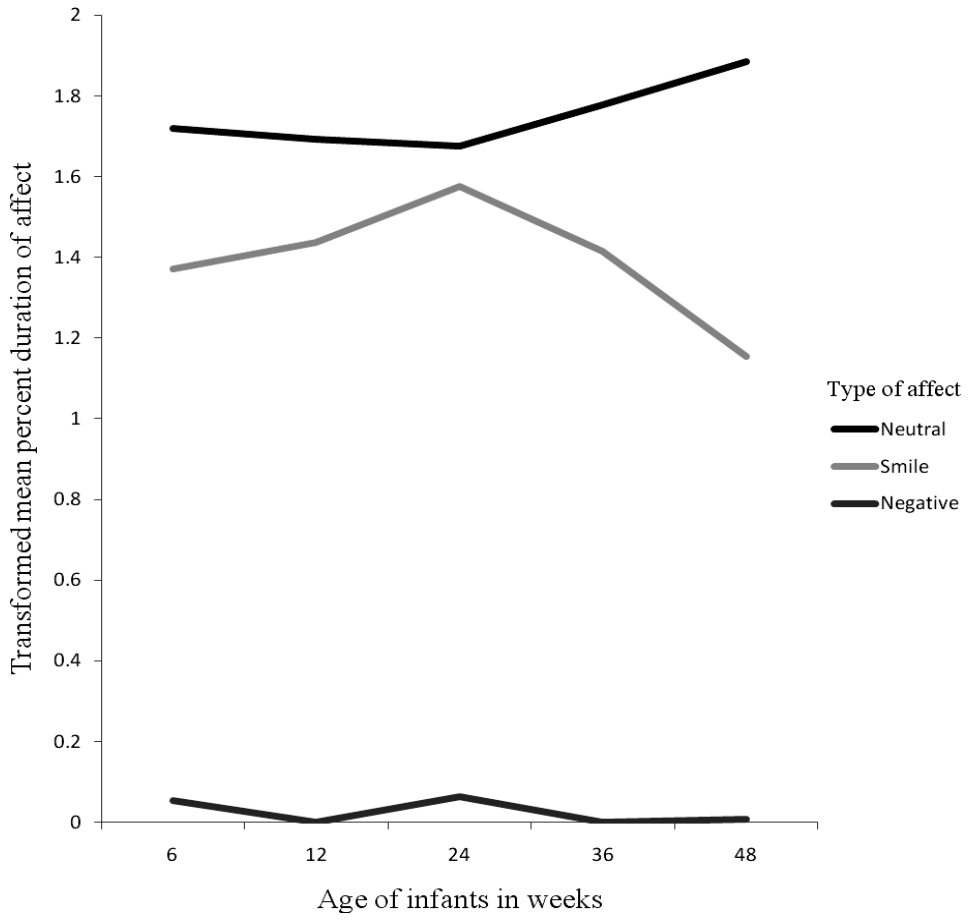

Figure 5. Transformed mean percent duration of overall maternal affect in mother infant free play across the first year

1.6 Intensity of touch

Due to the low frequencies of the category Moderate/Forceful touch - Range from 1.2 mean percent duration, (SD = 4.43) or approximately 3.6 seconds/300 seconds at 6 weeks, and 7.8 mean percent duration (SD = 24.68) or approximately 23.4 seconds/300 seconds at 12 weeks further analyses were collapsed across this category.

1.7 Uncodable Seconds

The mean percent duration of un-codable seconds in free play ranged from *M* =28.71 (*SD* = 80.28) at 24 weeks, to *M* = 6.66 (18.59) at 12 weeks. These percentages translate to approximately 86 and 19 seconds respectively out of a possible 300 coded. The means at 36 and 48 weeks were *(M* = 20.34, *SD*= 56.44) and (*M* = 26.87, *SD* = 75.08) respectively. These findings suggest that most of the five minutes chosen there were few periods where the infant and the mother could not be seen. The larger standard deviation at 12 months is likely a result of the infants mobility and the maintaining both faces in the camera at the same time. Infants at this age were mobile at floor level but by this stage could adjust their own position. At times this required a repositioning of the camera which resulted in some seconds lost.

Part 2: Developmental patterns in mother-infant interaction across two conditions

2: <u>Maternal touch</u>

2.1 Overall touch

The next set of analyses set out to examine the patterns of touch expressed by mothers by comparing the amount of touching behaviour during two conditions - free play and toy play - at 24, 36 and 48 weeks. The percent duration calculated for all forms of touch were combined to form an overall percent duration and were log transformed as in previous data analyses for each observation period and the developmental trajectory of overall touch used as the dependent variable in the repeated measures ANOVA that were conducted.

A 3 x 2 (Age x Condition) repeated measures ANOVA was conducted and revealed a significant main effect for age F (2, 66) = 38.77, $p < .05$, $\eta_p^2 = 0.54$, and a significant main effect for condition F (1, 33) = 46.94, $p < .05$, $\eta_p^2 = 0.59$. These findings are displayed in Figure 6. No significant interaction was found between age and condition.

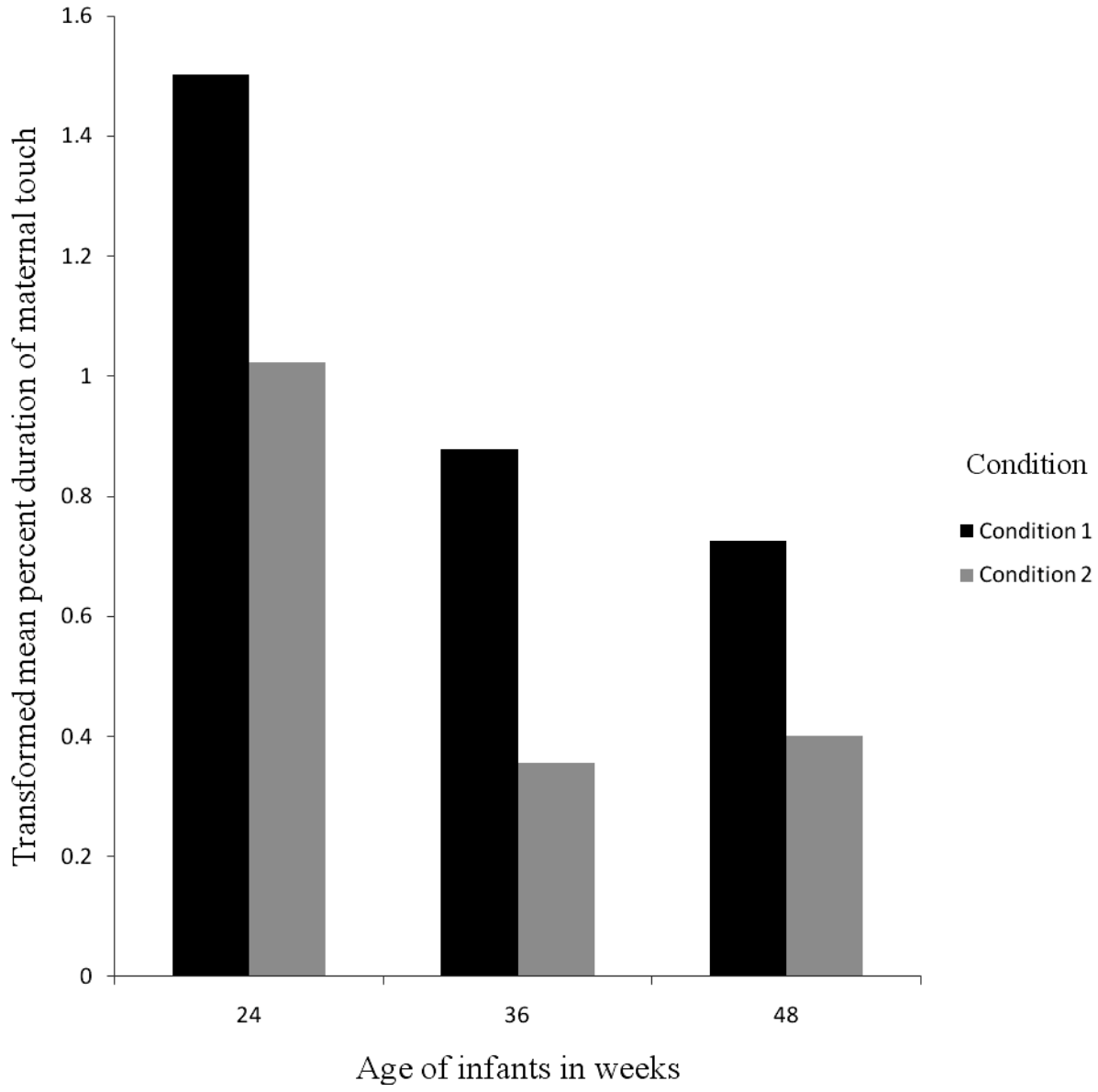

Figure 6 Transformed mean percent duration of overall maternal touch across age and condition

While the effect of age on overall touch has been outlined earlier, the significant main effect for condition is evidence for a perturbation of the interactive environment through the introduction of novel toys. To further explain these findings, contrasts reveal a significant difference between the consecutive ages of 24 and 36 weeks *F* (1,

33) = 45.62, p <.05, η_p^2 = 0.58 and a non-significant difference between 36 and 48 weeks.

With respect to condition a significant difference was found between condition 1 (free play) and condition 2 (novel toy play) F (1, 33) = 46.94, p < .05, η_p^2 = 0.59. While the effect of age on overall touch has been outlined earlier, the significant main effect for condition is evidence for a perturbation of the interactive environment through the introduction of novel toys.

Comparison of estimated marginal means attests to these findings. The mean at 24 weeks (M = 1.26, SE = 0.09) is significantly different to those at 36 weeks (M = 0.62, SE = 0.08) and 48 weeks (M = 0.56, SE = 0.08). The mean level difference between 36 and 48 weeks was non-significant.

Importantly, comparison of the means at each condition revealed a significant difference between condition 1 (M = 1.04, SE = 0.07) and condition 2 (M = 0.59, SE = 0.08). Specifically these data indicate that there was less overall maternal touching during novel toy play than free play, and that these differences were most marked between the ages of 24 and 36 weeks.

2.2 Type of touch

A 3 x 2 x 2 (Age x Condition x Type of touch) repeated measures ANOVA was used to examine if age and context had an effect on the type of touch mothers used on their infants during interactions in the two conditions. The two aggregated categories of passive and active touch patterns were used as the dependent variable in these analyses. A main effect for age was found F (2, 62) = 37.04, p < .05, η_p^2 = 0.54, as

was a main effect for condition F (1, 31) = 50.01, $p < .05$, $\eta_p^2 = 0.62$, and type of touch F (1, 31) = 19.68, $p < .05$, $\eta_p^2 = 0.39$. These results indicate that across age and condition mothers use more passive touch (M = .68, SE = 0.07) than active touch (M = .49, SE = 0.06) and that collapsed across condition age significantly affected the amount and type of touch mothers used in interactive episodes with their infants.

A modest type of touch by age interaction F (2, 62) = 4.40, $p < .05$, $\eta_p^2 = 0.12$, revealed that mothers used more passive touch than active touch at each time period but the introduction of novel toys reduced each type of touch significantly. Mothers used significantly more passive and active touch in condition 1 than condition 2 across all three ages.

Contrasts found, collapsed across condition and type of touch a significant difference between the consecutive ages of 24 and 36 weeks F (1, 31) = 41.61, $p <$,05, $\eta_p^2 =$ 0.57, again pointing to this period as a significant point of transition for interactive behaviour. Contrasts also confirm significant differences between the two types of touch between the ages of 24 and 36 weeks $F(1,31) = 8.45$, $p < .05$, $\eta_p^2 = 0.21$ but a non-significant difference between the two types of touch between the ages of 36 and 48 weeks.

Planned mean level comparisons indicated that significant differences existed between 24 weeks (M = 0.90, SE = .08) and the other two time periods 36 weeks (M = 0 .44, SE = 0.6) and 48 weeks (M = 0.40, SE = 0.06). In addition, based on the estimated marginal means, significant mean level differences were found between condition 1 and condition 2 (M = 0.76, SE = 0.07; M = 0.41, SE = -.06). The mean level difference between the two types of touch was also significant – Passive touch (M = 0.68, SE = 0.68) was used significantly more than Active types of touch (M =

0.49, *SE* = -.06). These means are depicted in Figure 7 and show the differences between condition across the three ages.

Taken together these data indicate that not only does the amount of touching decrease over the second half of the first year, but that there are differences in the type of touching. Passive touching remained higher in percent duration over the three ages than Active touching, but it was also sensitive to changes in the environment. The introduction of novel toys served to significantly reduce its duration and that this was most marked between 6 and 9 months of age.

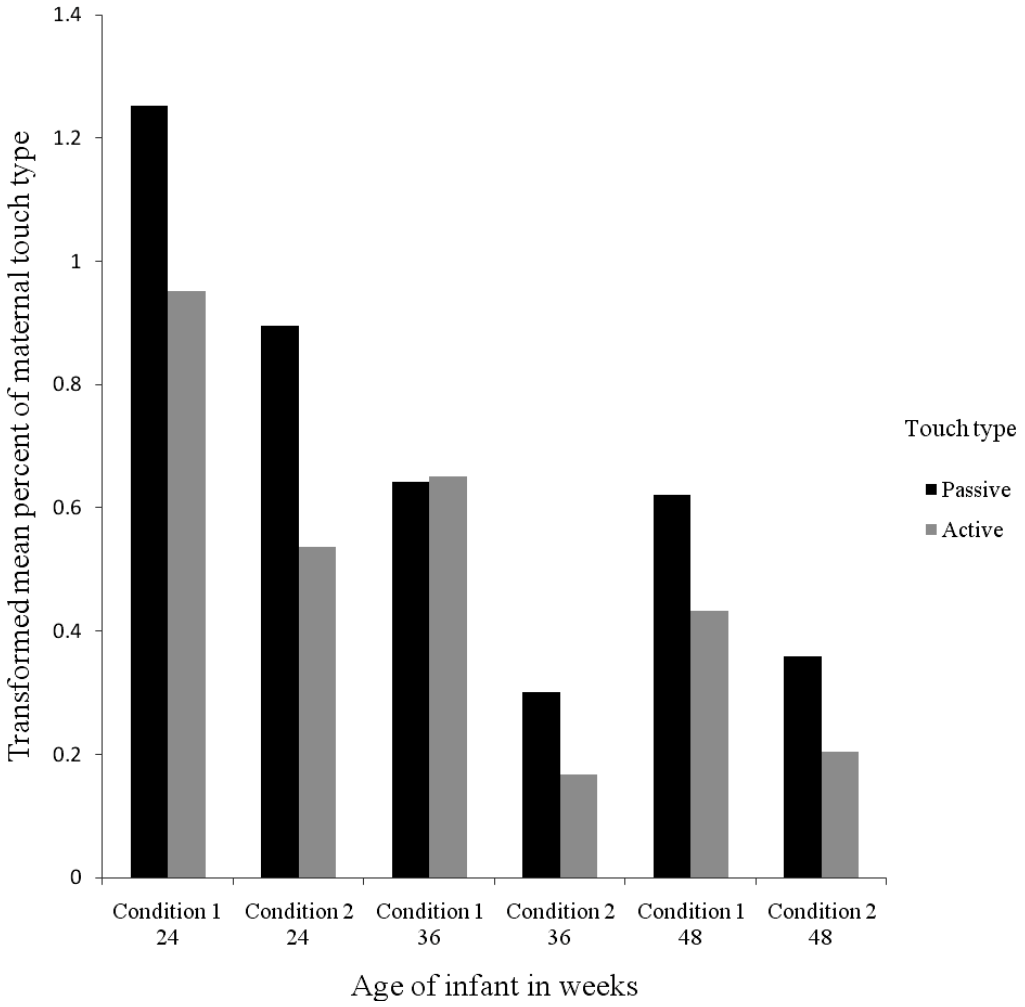

Figure 7 Transformed mean percent duration of maternal touch type across age and condition

2.3 Locations of Touch

The next set of analyses set out to explore if there were any differences between conditions 1 and 2, with respect to where mothers touched their infants. The effects of the perturbation on overall touch and type of touch have been outlined so it was an anticipated that with a reduction in touching there may be differences between the conditions for location of touch.

A 3 x 2 x 4 (Age x Condition x Location) repeated measures ANOVA was conducted, using the four locations of touch as the dependent variables. Significant main effects for age F (1.39, 43.03) = 50.03, $p < .05$, $\eta_p^2 = 0.62$, condition F (1, 31) = 49.91, $p < .05$, $\eta_p^2 = 0.62$, and location F (3, 93) = 66.42, $p < .05$, $\eta_p^2 = 0.68$ were found. For the main effect of age degrees of freedom were corrected using Greenhouse-Geisser estimates. Mothers were significantly more likely to touch the infant on the torso when touching their infant than any other area of the body coded.

Contrasts revealed that collapsed across condition and location a significant difference existed between the consecutive ages of 24 and 36 weeks F (1, 31) = 49.89, $p < .05$, $\eta_p^2 = 0.62$. Mean level differences were significant between 24 and 36 weeks and between 24 and 48 weeks (M = 0.63, SE = 0.07; M = 0.23, SE = 0.04; M = 0.22, SE = 0.04, respectively), and non-significant between 36 and 48 weeks.

Significant differences between the estimated marginal means of Condition 1 (M = 0.47, SE = 0.05) and Condition 2 (M = 0.25, SE = 0.04), is further confirmation of the finding that duration of touch decreased over time, but was further significantly reduced by Condition 2.

Post-hoc comparisons of touch locations mirrored the findings for overall touch in spite of the introduction of the perturbation. Significant mean level differences were found between torso (M = .66, SE = 0.06) and all other locations – head, feet or arms (Ms = 0.19, 0.25, 0.34; SEs = 0.04, 0.05, 0.05). The estimated marginal means were non-significant for head and feet. However the mean level comparisons for feet and arms were non-significant collapsed across condition which may be in part due to the finding of a slight increase in mothers touching the infants feet from 36 weeks to 48 weeks drawing the means of these two locations closer together.

Figure 8 shows the transformed means collapsed across condition and indicate the uniformity in the decrease location type. Apart from a slight increase at 48 weeks for both head and torso, there is clear evidence for mother's preference to touch the torso and arms of their infants. These consistent findings for location of touch and similar levels of variability as indicated by the standard errors (a measure of the standard deviation of the sample means) attest to stability in this variable over time and condition.

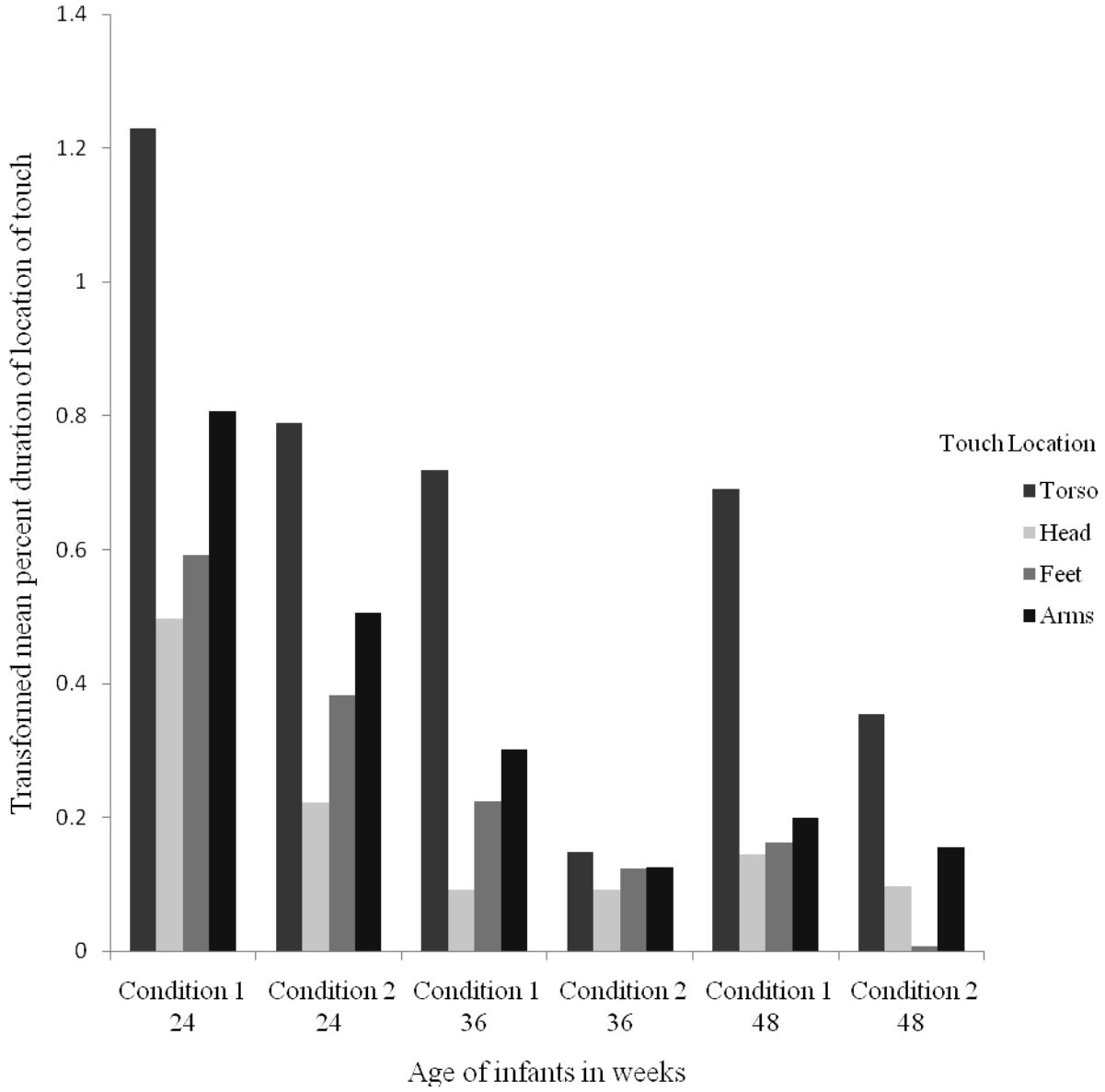

Figure 8 Transformed mean percent duration of maternal touch location across age and condition

2.4 Maternal Gaze Patterns

In a previous section, finding indicated that maternal gaze patterns were differentially affected by the age of the child. In order to examine if gaze was affected by a change in the interactive environment a 3 x 2 x 4 (Age x Condition x Type of Gaze) repeated measures ANOVA was conducted. There was a significant main effect for age

(Greenhouse-Geisser corrected degrees of freedom) F (1.67, 51.81) = 25.18, $p < .05$, $\eta_p^2 = 0.45$. Contrasts revealed significant differences between the consecutive ages of 24 and 36 weeks F (1, 31) = 10.89, $p < .05$, $\eta_p^2 = 0.26$, and 36 and 48 weeks F (1, 31) = 18.29, $p < .05$, $\eta_p^2 = 0.37$.

A significant main effect for condition F (1, 31) = 7.66, $p < .05$, $\eta_p^2 = 0.19$, and a significant main effect for gaze F (3, 93) = 205.61, $p < .05$, $\eta_p^2 = 0.87$ were also revealed in the ANOVA.

In addition there was a significant Age by Gaze interaction F (1, 31) = 18.87, $p < .05$, $\eta_p^2 = 0.38$, a significant Condition by Gaze interaction F (6, 186) = 14.50, $p < .05$, $\eta_p^2 = 0.32$, and a moderately significant 3 way interaction between Age, Condition and Gaze F (3, 93) = 15.90, $p < .05$, $\eta_p^2 = .08$.

Planned comparisons revealed significant mean level differences collapsed across gaze location at each age point – 24 weeks (M = 1.064, SE = 0.06), 36 weeks (M = 1.154, SE = 0.05) and 48 weeks (M = 1.23, SE = 0.05).

Significant mean level differences were found between Condition 1 F (M = 1.13, SE = 0.05) and Condition 2 F (M = 1.17, SE = 0.05). With respect to mean level differences between gaze locations, all mean level differences were significant apart from the mean level differences between gaze at body and object (M = 1.29, SE = 0.06; M = 1.25, SE = 0.058 respectively). The largest mean was gaze at face (M = 1.63, SE = 0.51), while the smallest mean was averted gaze (M = 0.43, SE = 0.07. These data need to be interpreted in light of the finding that both gaze at body and object were higher in condition 2 than 1 across all ages, while gaze at face and averted gaze remained higher in Condition 1 compared with Condition 2.

Further, transformed means of percent duration for face, body and object in both conditions at 48 weeks converge – Condition 1 (*Ms* = 1.51, *SE* = 0.06; 1.48, *SE* = 0.06; 1.37, *SE* = 0.07 respectively) and Condition 2 (*Ms* = 1.40, *SE* = 0.06; 1.61, *SE* = 0.05; 1.46, *SE* = 0.06).

Figure 9 shows the change in maternal gazing at all time periods in the second half of the first year collapsed across condition. The increase in gaze at body, object and averted gaze is clear along with the concurrent decrease in gaze at face. Gaze aversion was relatively stable over the last 3 time points and remained low relative to other forms of gaze direction.

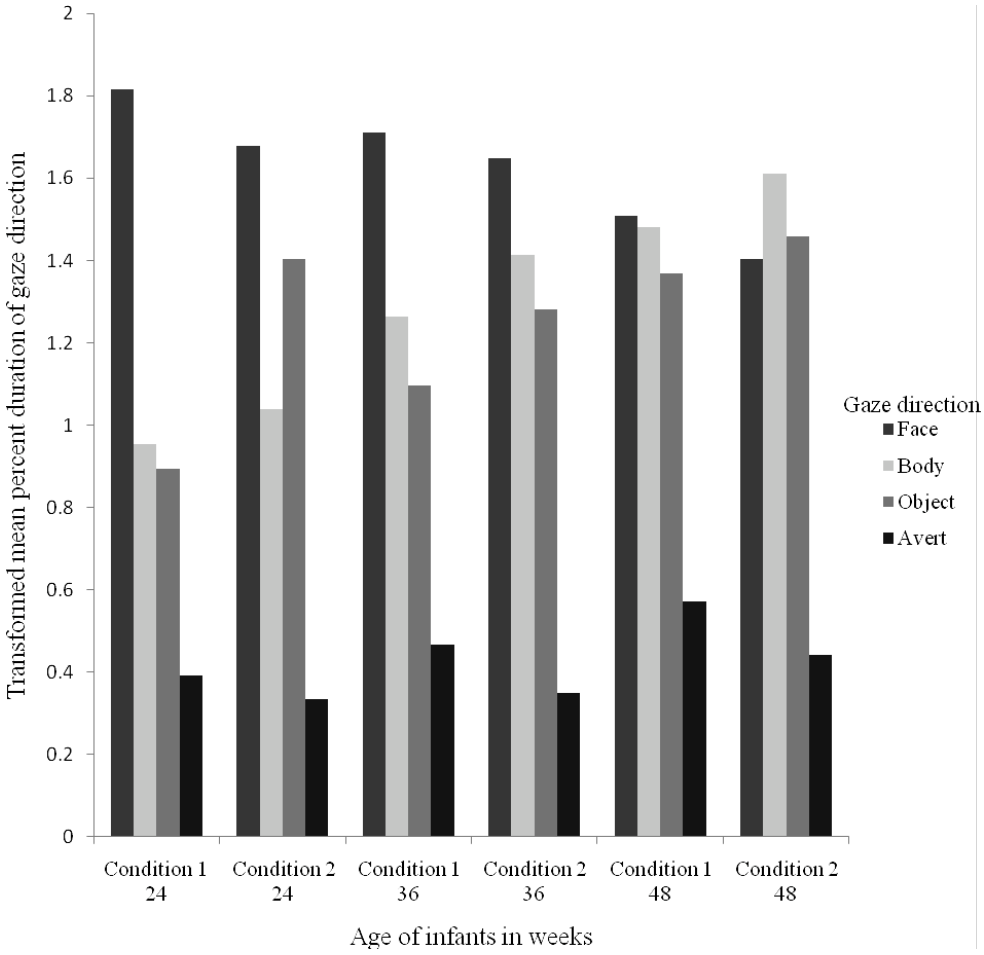

Figure 9 Transformed mean percent duration of maternal gaze direction across age and condition.

These data not only indicate change in gaze patterns over the second half of the first year but suggest that changes in where the mother directs her gaze during interactions is both a function of age of the infant and the environmental circumstances. Mothers were more likely to look at their infant's face during interpersonal engagement in free play, however when the dyad were engaged in play with novel toys the mother was more likely to look at the infant's body or an object.

2.5 Maternal Affect – smile, negative, neutral

When affect was measured across age findings indicated that mother used more neutral affect than smiling in their interactions with their infants and that negative affect was rarely used. The next set of analyses compared the same categories of affect and explored them across 2 conditions – free play and novel toy play. Results revealed that affect varied according to infant age, the condition and the interactions between the three sources.

Planned contrasts collapsed across condition and affect type revealed significant differences across age F (2, 62) = 4.05, $p < .05$, $\eta_p^2 = 0.12$, collapsed across age and affect significant differences in condition F (1, 31) = 27.75, $p < .05$, $\eta_p^2 = 0.47$, and collapsed across condition and age a significant difference in affect F (2, 62) = 901.8, $p < .05$, $\eta_p^2 = 0.97$.

There was a significant interaction between age and affect between 24 and 36 weeks F (1, 31) = 7.99, $p < .05$, $\eta_p^2 = 0.21$, and 36 and 48 weeks F (1, 31) = 65.77, $p < .05$, A significant interaction was also found between condition and affect, and indicated

there was a significant difference between neutral affect and smiling in condition 1 compared with condition 2 F (1, 31) = 57.25, $p < .05$, $\eta_p^2 = 0.65$.

These results indicate that affect is uniquely affected by age of the infant, and is further sensitive to environmental changes such as the introduction of novelty into dyadic play.

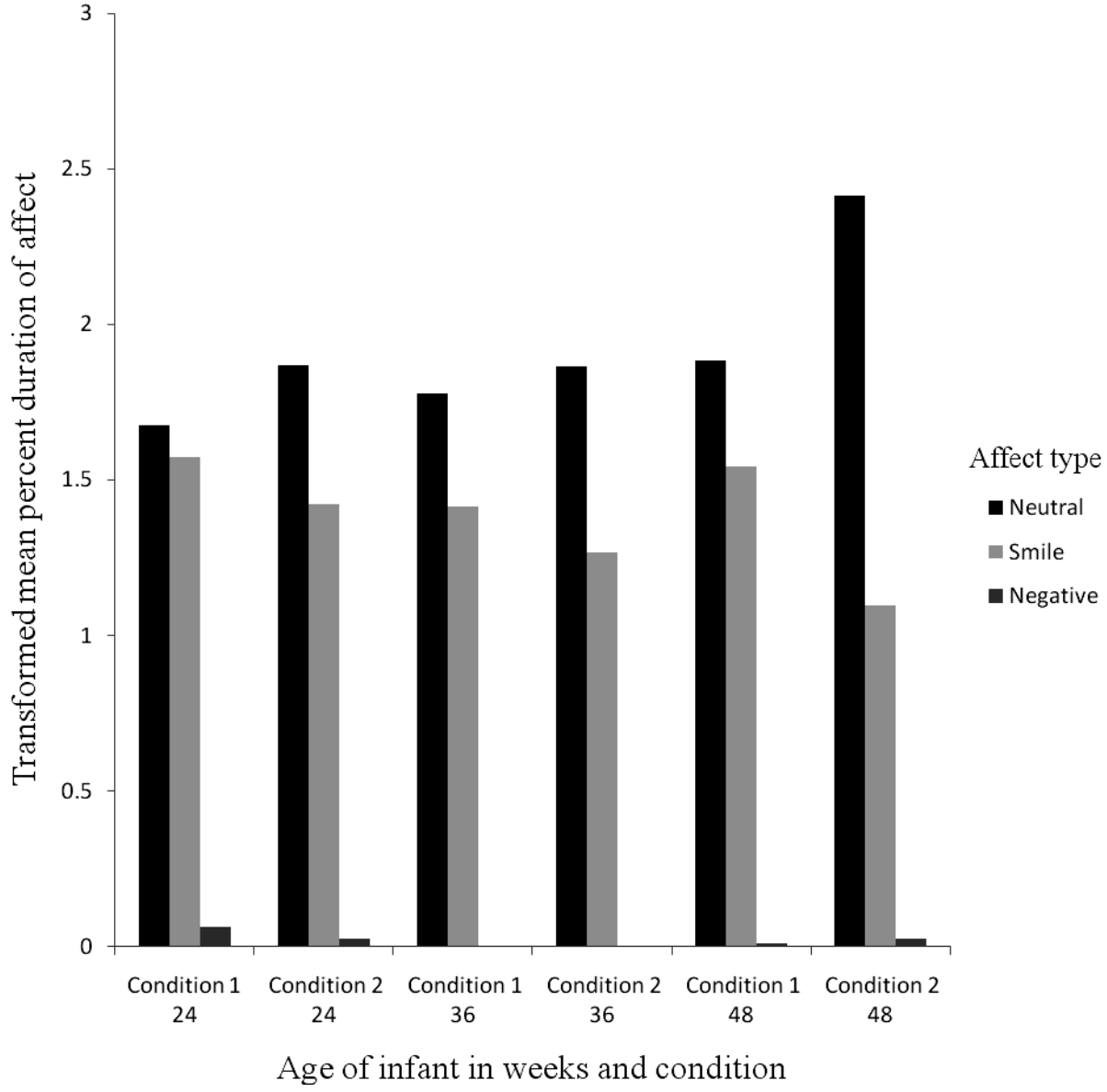

Figure 10. Transformed mean percent duration of maternal affect across age and condition.

Mean level comparisons confirm several interesting features of these results.

Collapsed across condition and affect type the mean level comparisons show stability across age for the expression of affect. Figure 10 shows the linear relationship between all forms of affect that are stable over time. Neutral affect, smiling and negative affect show very little variance over time – at 24, 36 and 48 weeks the combined means were 1.105; 1.054; 1.096, and *SEs* were 0.04; 0.035; and 0.037.

Mean level comparisons also indicate that there is a significant difference between all types of affect – neutral (M = 1.914, SE = 0.05), smiling (M = 1.322, SE = 0.059) and negative *(*M = 0.02, SE = 0.011).

The interaction between condition and affect is confirmed by comparison of means of affect in each condition. Higher duration of neutral affect is confirmed in condition 2 (M = 2.048, SE = 0.049) compared with condition1 (M = 1.78, SE = 0.053). In addition there was less smiling in condition 2 compared with condition 1 (M = 1.262, SE = 0.06; M = 1.381, SE = 0.062 respectively.

Results indicate that maternal affect is mediated by the age of the child and the introduction of novelty in the form of toys into play with their infants. Whilst neutral affect remained high, overall there was less smiling. These data need to be integrated into the findings of this study that the perturbation of condition not only influenced affect but also the direction of the gaze to increased gaze at infants body and an object.

Part 3 Developmental patterns in mother-infant interactive patterns

3. Infant Interactions

3.1 Infant Gaze patterns across the first year

To examine if there were changes in the direction of infant gaze during free play episodes across the first year the mean percent duration of gazing at the mothers face, body, an object and gaze aversion was used as the dependent variables in analyses.

A 5 x 4 (Age x gaze) repeated measures ANOVA a significant main effect for age F (4, 124) = 13.96, $p < .05$, $\eta_p^2 = 0.31$, a significant main effect for gaze F (3, 93) = 27.86, $p < .05$, $\eta_p^2 = 0.41$ (corrected for Greenhouse-Geisser estimates), and an interaction between age and gaze F (12, 372) = 21.23, $p < .05$, $\eta_p^2 = 0.41$. Planned comparisons, using Bonferroni corrections showed mean level differences between 6 weeks (M = 1.02, SE = 0.038) and all other age points. No other mean level differences were statistically significant.

Contrasts revealed that collapsed across type of gaze a significant difference was found between 6 weeks and 12 weeks F (1,31) = 25.63, $p < .05$, $\eta_p^2 = 0.45$. In addition contrasts revealed a significant difference between gaze at face F (1, 31) = 43.88, $p < .05$, $h_p^2 = 0.59$, and gaze at body F(1,31) = 59.63, $p < .05$, $\eta_p^2 = 0.66$ and that gaze at body was significantly different to gaze aversion F (1,31) = 6.47, $p < .05$, $\eta_p^2 = 0.17$.

Contrasts by their nature compare consecutive levels of variables and as such when the variable is categorical not all possible comparisons between categories are conducted. However contrasts did reveal that the effects of the interaction in the

significant differences between gaze at face and gaze at body at consecutive time points of 6 and 12 weeks, 12 and 24 weeks, and 36 and 48 weeks.

Planned comparisons showed that gaze at face (M = 1.21, SE = 0.06) showed mean level differences with gaze at body (M = 0.89, SE = 0.06), gaze at object *(*M = 1.41, SE = 0.07) but not with gaze aversion (M = 1.24, SE = 0.05).

Taken together these results present a juxtaposition of age and gaze that was not predicted. Examination of Figure 12 indicates that these results as a groups attest to the complex nature of the development of gaze behavior over the first year.

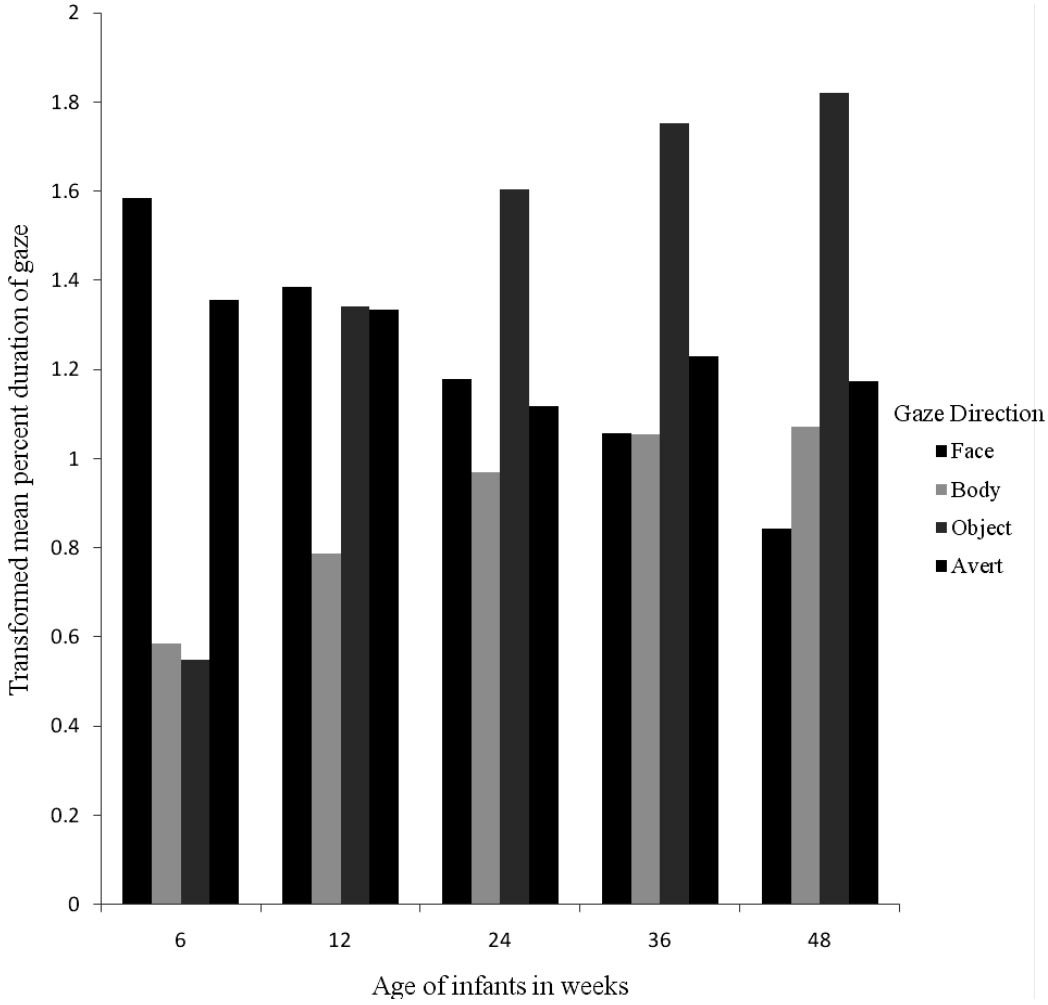

Figure 11 Transformed mean percent duration of infant gaze direction in free play across the first year of life.

The decrease in gaze at face mirrors the pattern found for the mothers. Longer gazing at an object increase dramatically from 6 to 12 weeks and continued a curvilinear rise up to 48 weeks. Gaze at body also carved a curvilinear rise over the first year, while in spite of a sudden drop in duration at 24 weeks gaze aversion also decreased from 6 weeks to 48 weeks. From 24 weeks all infants gazed at an object more than any other target.

3.2 Infant Gaze patterns across two conditions – free play and toy play

To examine if these patterns of infant gaze were affected by the introduction of novel toys, a 3 x 2 x 4 (Age x Condition x Gaze), repeated measures ANOVA was conducted. Results revealed a significant main effect for Condition F (1, 31) = 48.99, $p < .05$, $\eta_p^2 = 0.61$, and for Gaze Type F (3, 93) = 228.17, $\eta_p^2 = 0.88$. No significant main effect was recorded for Age and mean level comparisons indicate little difference between the means at 24, 36 and 48 weeks (*Ms* = 1.15, 1.19, 1.18; *SE*s = 0.054, 0.05, 0.052) indicating that age alone counted for but a small part of the variance in results.

However mean level differences between the means of condition (collapsed across age and gaze type) did reveal a significant difference (the mean of Condition 1 (M = 1.24, SE = 0.052) and Condition 2 (M = 1.11, SE = 0.05). Given the effect size from the main ANOVA table coupled with this result points to the finding that where an infant looks is affected by the interactive context. From these results both touch and

gaze are sensitive to novel toy introduction, arguably a feature of naturally occurring environmental change for dyads.

When the mean level differences are examined between gaze types this implication is supported. From earlier analyses there is an awareness that gaze at mothers face decreased over time with a concurrent rise in gaze at body and exponential growth in gaze at object from around the third month of life.

Transformed means for gaze at mothers face, gaze at mothers body, gaze at object and gaze aversion were (M = .88, SE = 0.6; M = .97, SE = 0.63; M = 1.83, 0.05; M = 1.02, SE = 0.05 respectively). Mean level differences, using Bonferroni corrections were significant between gaze at object and all other types of gaze. Further, gaze at object collapsed across condition were higher at all age points. When the types of gaze were compared across condition only gaze at object was higher at all time points and gaze at body at 48 weeks. These results, shown in Figure 12 indicate a shift in gaze patterns in the last half of the first year that are not only a function of age but of changes in the immediate interactive environment. Infants increased gaze at an object may seem intuitive given development however coupled with an increase in gaze at the mothers body with sensitivity to environmental elements of interaction hints at the interaction of these factors in ongoing communicative exchanges.

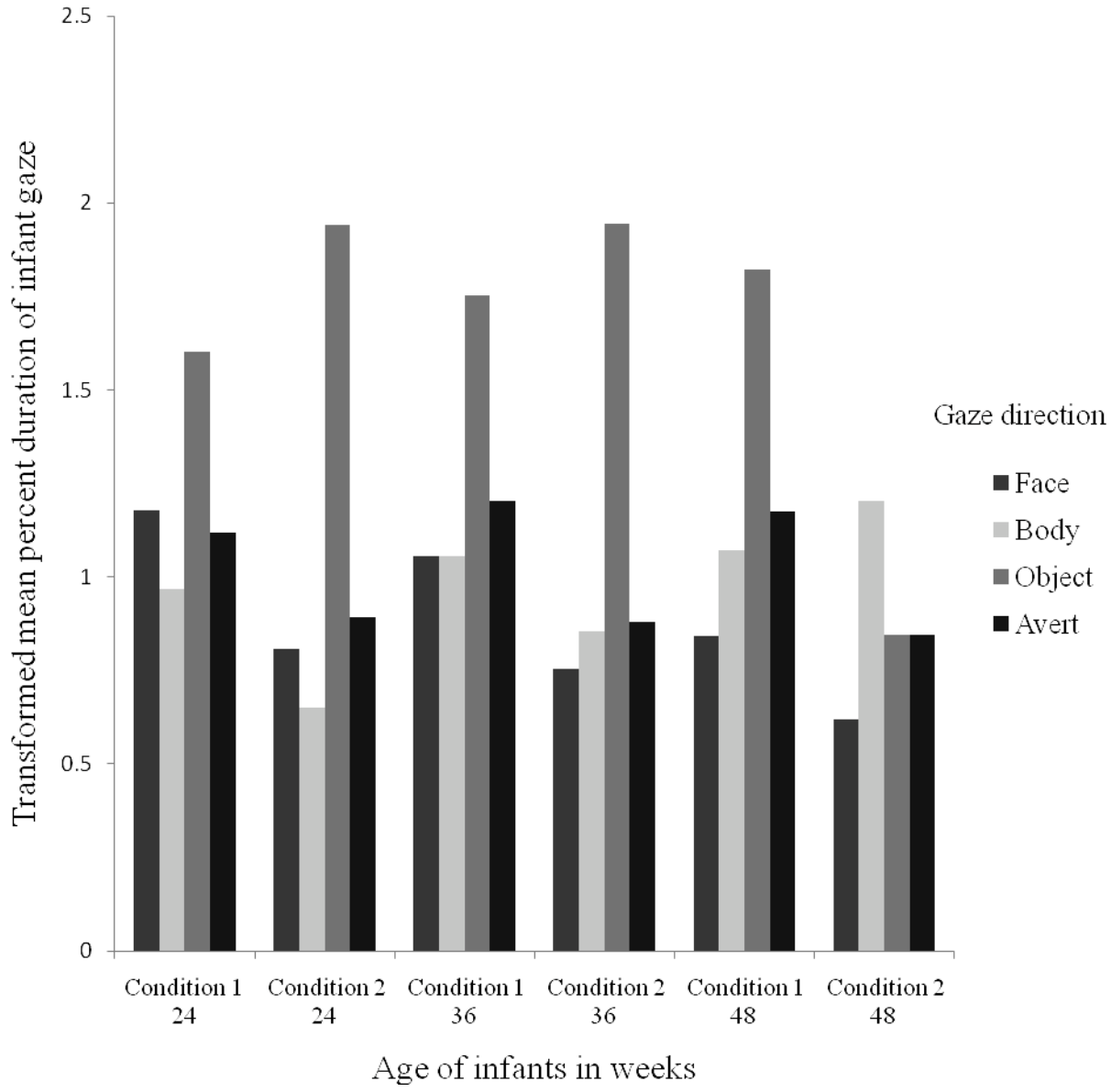

Figure 12 Transformed mean percent duration of infant gaze direction across age and condition

3.3 Infant Affect across the first year

Infant affect was measured using the same categories as the mothers affect – neutral, smile and negative. Using repeated measures ANOVA to chart infant affect across the first year results indicate change over time.

A 5 x 4 (Age x Affect type) repeated measures ANOVA was conducted. Similar to the mother's results, a main effect for affect type F (2, 62) = 939, $p < .05$, $\eta_p^2 = 0.96$, and an interaction between age and affect F (8, 248) = 4.85, $p < .05$, $\eta_p^2 = 0.135$, were found. These data along with mean level comparisons confirmed that infants like their mothers were more likely to exhibit a neutral facial expression across the first year collapsed across age. The mean level differences were significant for all multiple comparisons – neutral, smile and negative - *Ms* = 1.901; .934; .209; and *SE*s = 0.025; 0.038; 0.03. The percent duration of neutral affect for infants compared with their mothers was higher. The overall mean for negative affect was small relative to neutral and smiling affect.

Planned comparisons highlighted significance between neutral affect and smiling collapsed across the first year F (1, 31) = 570.09, $p < .05$, $\eta_p^2 = .948$. This indicates that infants are more likely to display neutral affect when interacting with their mothers in free play. This finding mirrors the findings for the mother and should be interpreted in light of other communicative variables.

As Figure 13 shows, there is stability across age for all forms of affect for infants in this study. Higher levels of neutral gaze are clearly seen and with slight changes in neutral gaze and smiling can be seen between 12 and 24 weeks.

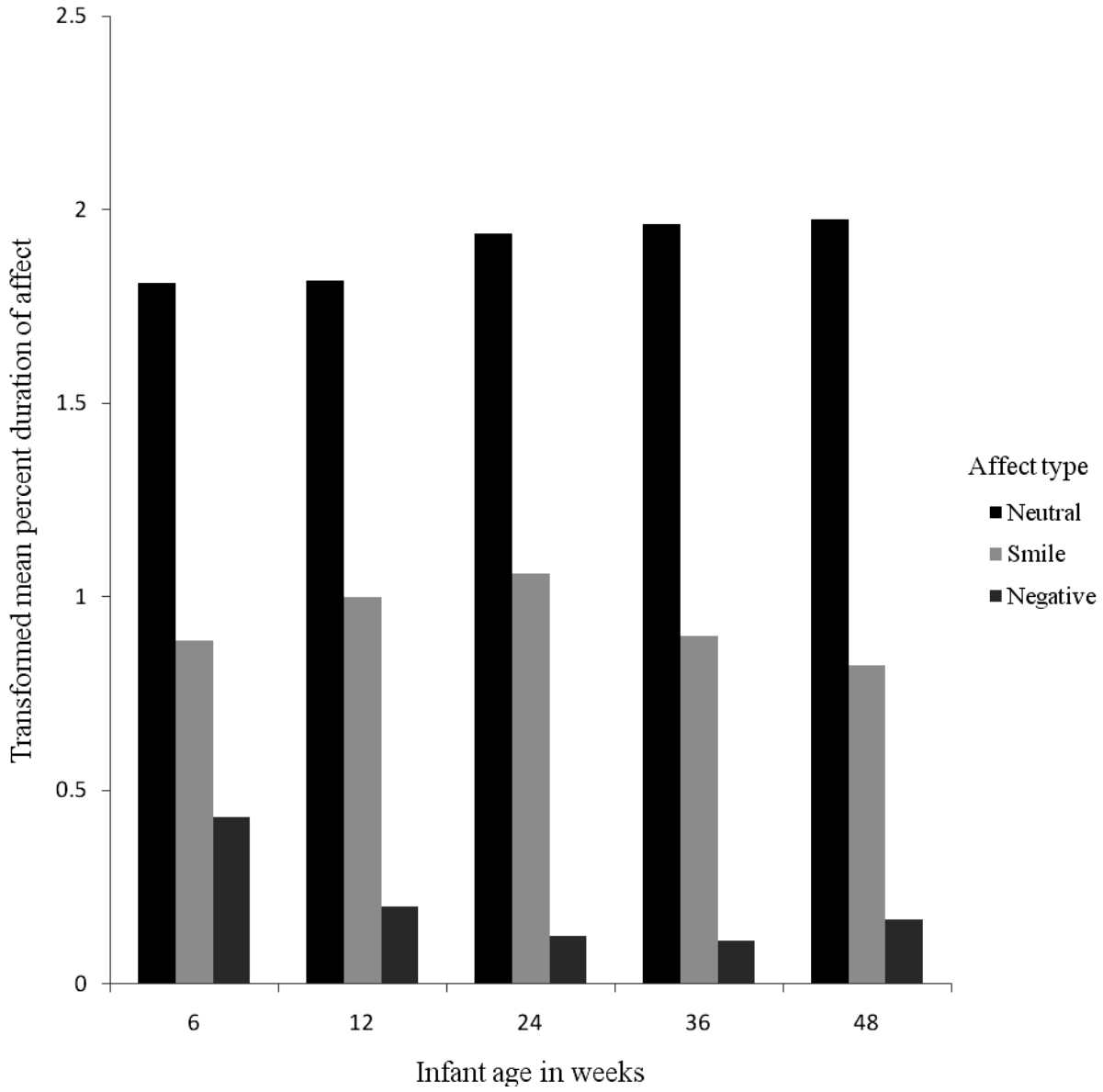

Figure 13 Transformed mean percent duration of infant affect in mother-infant free play across the first year

3.4 Infant Affect across two conditions – free play and toy play

Again the same affect groups were used to explore the potential effects of the two conditions on infant affect using repeated measures ANOVA to chart differences for infants across the free play and novel toy play conditions which are displayed in Figure 14.

A 3 x 2 x 4 (Age x Condition x Type of Affect) repeated measures ANOVA revealed a main effect for age F (2,62) = 3.57, $p <$ .05, η_p^2 = .103, a significant main effect for condition F (1, 31) = 12.52, $p <$ .05, η_p^2 =0.28, and a significant main effect for affect type F (2, 62) = 130.33, $p <$ .05, η_p^2 .97. In addition to this a significant interaction was revealed between condition and affect type F(2, 62) = 24.46, $p <$ .05, η_p^2 = .44.

Tests of within subject contrasts revealed significant difference between the type of affect expressed and the two conditions of free and toy play F (1, 31), = 12.52, $p <$ .05, η_p^2 = 0.29, and a significant difference collapsed across age between neutral affect and smiling F (1, 31) = 101.24, $p <$ .05, η_p^2 = 0.97, and between smiling and negative affect F (1, 31) = 238.2, $p <$ .05, η_p^2 = 0.89. Repeated contrasts do not allow for all comparisons, however a condition by affect interaction was observed between two conditions and between neutral and smiling affect F (1, 31) = 34.68, $p <$ .05, η_p^2 =0.53.

Mean level comparisons show a significant difference between Condition 1 (M = 1.007, SE = 0.048) and Condition 2 *(*M = .927, SE = 0.044). These data indicate that the change in the environment at condition 2 changed the affective behaviour of the infant. Mean level comparison of the type of affect (shown in Figure 14) revealed significant differences between all types of affectual displays. For neutral affect (M = 1.998, SE = 0.048), for smiling (M= 0.78, SE = 0.06) and for negative affect *(*M = .122, SE = 0.039) indicating collapsed across age more neutral affect was used.

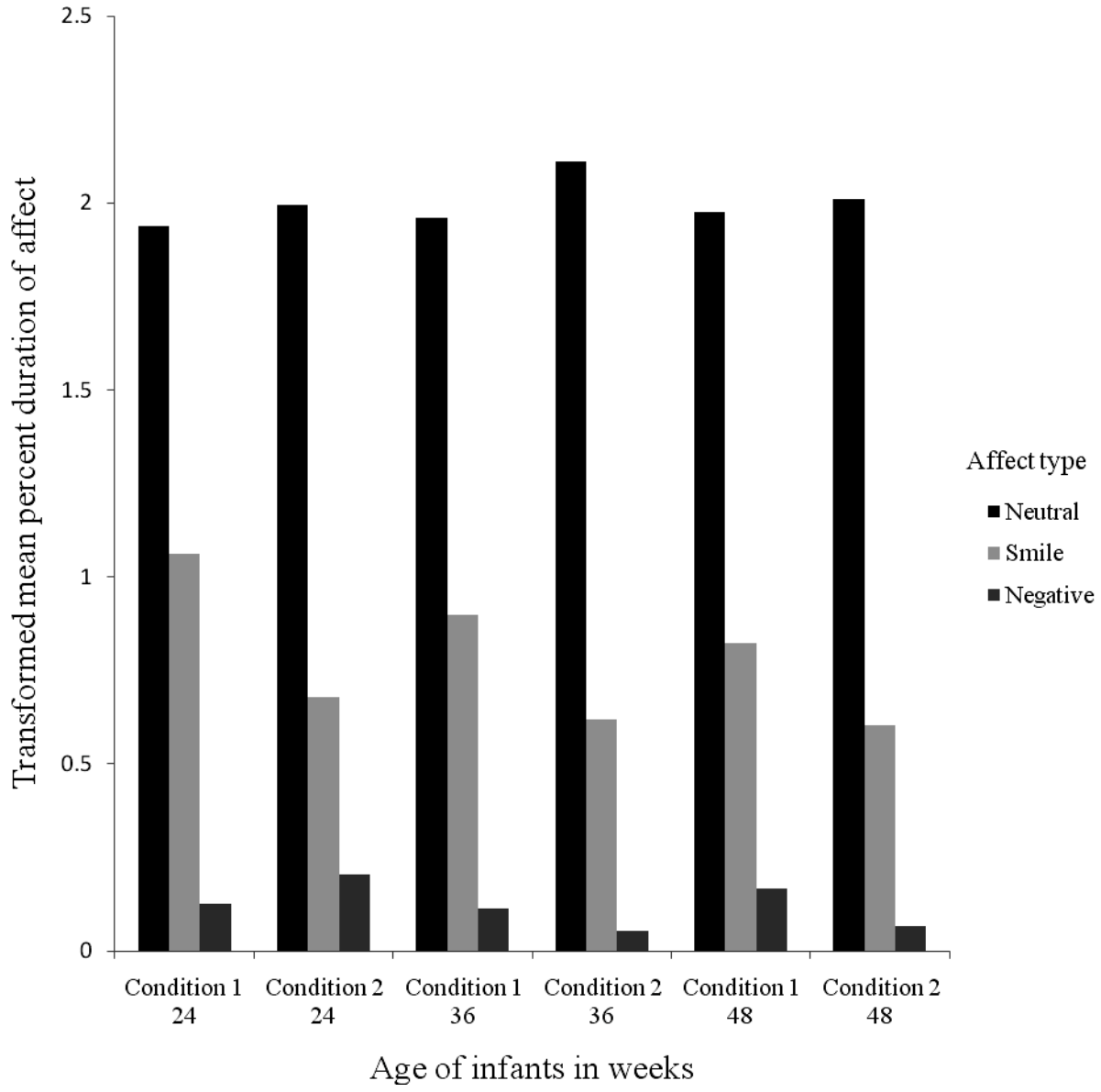

Figure 14 Transformed mean percent duration of type of infant affect across age and condition.

These data indicate that that infant's affect changed when environmental conditions changed, and that age (time) also impacted on affect expressed. Specifically, infants were more likely to interact with their mothers using neutral expressions, and they were more likely to smile during free play interactions. Playing with novel toys served to increase neutral affect and reduce smiling in infants. These data need to be

combined with the other modalities of communication so that an integration of information can attest to the 'alive communication' of the dyads, rather than interpreting each one in isolation from one another.

3.5 Infant initiated touch patterns

Infant touch in this study was coded as any form of touch of the mother *initiated* by the infant. While other studies have spent considerable time coding infants touching themselves and their mothers in laboratory settings, very little is known how about how infants touch others during naturalistic play and social interactions.

To this end an attempt was made to observe and code all instances of infant initiated touch with the purpose of contributing to the durations and types of touch that emerge during development *without* rigid boundaries of experimental condition..

Given the low frequencies to report on raw means achieves reporting the data of individual infants within the context of the dyad and does not reduce the data to global scores.

The first item of import is the fact that all infants initiated touch with their mothers at some time in the second half of the first year, during mother-infant free play. What is not evident from any numerical data however, that there was a commonality to this touching.

Infants initiated touch with their mothers at 24 weeks (n=4), 36 weeks (n=16) and 48 weeks (n=21). Only one infant initiated touch with their mother across all ages and the duration of these touches were 2.00, 4.33 and 4.67 respectively.

The total amount of touching at 24 weeks was 7.66 mean percent, while the mean was .24. At 36 and 48 weeks these numbers rose (*M* = 2.05 with a total of 65.67 mean percent duration; *M* = 3.26 with a total of 104.32 mean percent duration).

Secondly of the 21 infants who initiated touch at 48 weeks, 16 of them followed the same sequence of initiating tactile behaviour. These infants approached their mothers (kneeling on the floor) place their hands on the mothers knee or leg, then attempted to climb up the mother and then gain face to face contact with her. This approach-then-touch-then-gaze sequence appeared without prompting and appeared to be a natural part of the repertoire of the dyads. Without the specification of maternal responses to these touches in this thesis (a limitation but could be included in future analyses), and without attaching meaning to them they can at best be interpreted as approach and proximity gaining behaviour. That is they provide close contact for the infant with their mothers and appear to be goal directed. That across dyads infants displayed this behaviour is of interest in terms of how infants growing behavioural repertoire increases to include touching others, and speaks to the physical availability of their mothers facilitating the process. Further analysis is indicated here.

During the toy play contexts four infants touched their mothers at 36 and 48 weeks. These periods of touch were brief (*M* = .15; *M* = .49 respectively) and involved passive touch on the mothers arms, leg and body.

3.4 ITSEA – the use of a developmental screen

Of the 32 participants, only 28 mothers fully completed the ITSEA questionnaire. Two mothers indicated that they had changed their mind at the final data collection point and did not want to complete the questionnaire. In addition one mother was not videoed when her child was 12 months due to changed contact details and another mother did not complete the questionnaire in full despite being given two questionnaires on two separate occasions. While these issues are limitations of sample size and perhaps fatigue with the study, their interactive data were not excluded from analyses. The purpose of the ITSEA was to screen the infants for issues such as atypical behaviors, or externalizing behaviors linked to developmental risk (Briggs-Gown & Carter, 2007), that might negatively impact on the assumption that all infants were healthy, and developing social, emotional and cognitive skills within normal expectations as reported by the mother. Domain scores on the ITSEA (and the shortened version BITSEA), have been highly positively correlated with other developmental scales – Child Behaviour Checklist, Vineland Adaptive Behaviour Scale and the Mullen Scales of Early Learning (Briggs –Gowan & Carter, 2007), and was expected to confirm the developmental health of the infants in the study. The 28 completed questionnaires were analyzed, converted to subscales and then scores for the four broad domains (Internalizing, Externalizing, Dysegulation, Competence) were calculated. Although *T* scores were developed for the four domains, there is little information regarding the makeup of the normative sample (Guess, 2006). It is reported that "*T* scores ≥63 are interpreted *of concern*" (Briggs – Gown & Carter, 2007), or 1.5*SD* above the mean for Internalizing, Externalizing and Dysregulating domains, or 1.5*SD* below the mean for the competence scale.

Questionaires in this thesis were analysed using the means and standard deviations of the normative sample to compare and evaluate maternal ratings of the four broad domain scores and scan for dyads where the child might present with characteristics of being at risk. No infants presented with concerns as defined by the measure. However, one boy was rated by his mother as high on the Dysregulation domain at 12 months, although his score did not exceed the standards set by the measure for being of concern.

Table 3. ITSEA Broad Domains means, *SD*s across dyads.

Domain	**Mean**	***SD***
Externalizing	.43	.23
Internalizing	.36	.11
Dysregulation	.51	.27
Competence	1.12	.29

The results of table 3 are comparable to the data gathered on a sociological and demographically diverse group of 1,235 infants across ages (Carter, Briggs-Gowan, Jones & Little). All the domain scores in this thesis are within .02 and .13 (Internalizing) of the means, and .01 and .10 (Internalising) of the standard deviations.

The data indicated that all infants, as reported by their mothers were developing within normal limits as measured by the ITSEA.

The significant limitation is that cut off scores were not compared for all infants across age and subscales which would give a full picture of development and enable the isolation of particular behaviors. This will be important to add in the future if this sample is to be tracked over time and linked to later cognitive and social development across ages. The publication of the cut off scores and the scoring instrument can be bought on line and were not known to this author at the time of analysis and writing.

Cutoff scores are now available for subscales of the instrument according to age and sex of the infant. These did not form part of the analyses here but would be beneficial in the future for tracking development over time if the participants were to be included in future research of interactive patterns and developmental trajectories.

Moreover the data could then be integrated more specifically with respect to gender and other demographic variables into the interactive research undertaken here. For example including systemic data (touch, affect, gaze) gathered over time needs to be related to how mothers reports affect e.g. smiling are related to lower rates of externalizing problems, more secure attachment and the communication positive internal expression (Messinger, 2005). This would improve the dynamism of questionnaires claiming to predict outcomes for children without reference to context and the transactional processes from which these constructs emerge (Sameroff & Mackenzie, 2003).

3.5 Growth curve analysis

While mean level comparisons can inform change or stability over time, there is little or no reference to the degree dyads as units behave within the overall group. It is reasonable to assert that while the sample may change over time and condition, individual dyads may remain stable across some variables e.g. high overall percent duration of touching, indicating how specific dyads are organized. Thus it was decided that growth curve models and linear modeling would be appropriate to explore features of touch over time for the dyads.

Growth curves or polynomials allow a researcher to track the rate of change in variables over time. They are particularly useful for longitudinal data with repeated measures designs when the same individual is measured over multiple time points using the same variables as in this thesis. They can be characterized in multilevel terms as nested data of two levels where repeated measures of the individual (Level 1) are nested in the differences between individuals (Level 2). This then allows the researcher to predict patterns of change using specific between individual variables as predictive of the change over time.

To this end a growth curve analysis was conducted using overall maternal touch across the first year as the outcome variable and using time as the predictor variable to model change in mothers touch of their infants across the first year. This was in an effort to find the best trend to explain the change. Because there were five time points it was possible to fit up to a fourth-order polynomial. Analysis was conducted to test for a linear trend over time, to test for quadratic trend time*time, and to test for a cubic trend time*time*time.

Form the repeated measure data there was evidence for a linear relationship between time and overall maternal touch and some evidence that in the early weeks after birth and the later weeks of the first life that maternal touch showed stability across dyads. An autoregressive covariance structure was chosen (AR1) as variances are assumed to be heterogeneous and indicated for repeated measures data (Field, 2005). In addition the model was run using a diagonal covariance structure, which is a simpler model but also assumes variances are heterogeneous. Models can were compared using the differences in the -log-likelihood as each polynomial is added to the model.

Findings from the first analysis showed that the linear trend was significant, F (1, 137.59) = 164.41, p <. 05. Following this, the quadratic trend was entered and revealed no significant improvement in the model F (1, 136.15) = .758, p >.05. This was confirmed by comparing the -2Log Likelihood with the linear model where the difference was (279.469 – 278.719) = 0.75, a non-significant chi-square difference.

The next step was to enter the cubic trend or third-order polynomial to the model to see if this improved the model, and indicate two changes in the direction of the linear trend. This result was significant F (1, 142.318) = 13.76, p <.05. The differences between the -2Log Likelihood scores for the quadratic and cubic polynomials confirm this result (278.719 – 265.639) = 13.08, a significant chi-square change.

These data indicate that cubic trend best describes the data and confirms the overall pattern of maternal touching across the first year. The trend in the data is best described by a third order polynomial. This reflects the initial stability in maternal touch across the infants first two months of life a linear relationship between time and maternal touch in the ensuing months and a further period of stability in the later weeks of the first year.

A repeated measure linear mixed model analysis was then conducted to create a model where within individual variance is level one of the model and level 2 must become the between subject random effects.

Using an intercept only model time was entered as a factor to model mothers overall touch over time using time as a fixed effect. The result was significant F (1, 75.97) = 231.97, $p < .05$ indicating scores on overall touch varied by the time of measurement indicating that there was a time effect by which touch decreased between mothers over time.

Further analyses using demographic variables did not improve the model which was confirming of ANOVA results and indicative of the demographic distribution of the sample. A scatterplot examining the shape of trajectories of dyads over time showed that while there was considerable variation at age 6 and 12 weeks the plot showed the decrease in touch over time and highlighted by linear and cubic fit lines, the majority of the mothers trajectories clustered around the same plot points. This indicates little between subject variability and accounts for the fact that time (infant age) accounted for most of the variability in overall maternal touching.

CHAPTER 4. DISCUSSION

One of the main objectives of this observational study, was to conduct a longitudinal exploration of dyadic touching during mother-infant interaction to clarify how naturally occurring patterns of touch change over time, and to explore the implications for the role touch plays in infant development across the first year. Specifically stability and change in touch patterns were explored in both real-time (second-by-second) and developmental time (across the first 12 months of an infants life). At the time of writing no other longitudinal study, this author is aware of explores touch in naturalistic social interactions between mothers and their babies exists. Historically the developmental psychological literature has produced significant studies that have provided careful and detailed analyses of the behaviour of mothers and infants (Ainsworth & Wittig, 1969; Cohn & Tronick, 1988; Sander, 1962), and whose microanalytical processes have provided both balance and systemic analyses of behaviour that continue to be cited and held as evidence for the imperative ecological contexts in which they occur. The metaphor of concentric circles Bronfenbrenner's (1979), is particularly salient when one considers how the touch behaviour of individuals is inexorably nested within systems – dyads, families, communities, culture – if one cannot touch without being touched (Montagu, 1971), then by highlighting discrete maternal and infant touch patterns by implication they become dyadic.

Certainly, a goal of the study was to provide local and naturalistic data on the development of specific types and locations of data *as they were embedded* within an array of other interactive non-verbal modalities. To this end micro level patterns of behaviour rather than global constructs such as attachment, temperament or maternal

sensitivity inform this thesis. Despite the characterization of touch as an important channel of communication between a mother and her child, the scarceness of data from natural contexts is in stark contrast to the bulk of data gathered in the laboratory. Moreover, acknowledgement that the relationship between touch and other social behaviors e.g. gaze and affect is complex, is supported by microanalytic procedures (Ferber, Feldman & Makhoul, 2008; Jean, Stack & Fogel, 2009; Stack & Muir, 1990; Stack & Arnold, 1998).

Thus, inherent in this thesis was a motivation to contextualise touch within social interactions. There was no attention to self-touch, touch of an object or touching another with an object. The thesis was limited to those behaviours that were social, intimate and part of naturally occurring patterns that unfolded in real-time for the dyads. Tracking these relationships over time was seen as a crucial contribution to the literature, which demands convergent data from diverse contexts to strengthen the inferences drawn regarding touch development and its role in infant development.

Moreover, because maternal touch may evolve with time, and its interactive meaning may change with development, it was important to provide meticulous normative data as a basis for understanding high-risk development or protective strategies for infant development.

Finally, the theoretical orientation of the thesis is dialectic as it stresses the constant interplay between behaviors, and dyadic and environmental factors that embrace functionalism. There was no *a priori* assumption of touches, smiles, or eye gaze regarding the assignation of meaning, and an overriding commitment to document behaviour expressed rather than any underlying causal reasons for the presence of communicative displays. Furthermore, the conceptualization of touch and its

covariance with other modalities, and the acknowledgement that there is a dearth of literature examining infants initiated touch with mother (Hertenstein, et al, 2007) set the backdrop for this research.

The results of the thesis speak to the centrality of touch in maternal and infant social exchanges and will be interpreted in light of the theoretical postulates of attachment theory, systems theory and bio-ecological model stressing the sensitivity of individuals to the environments of which they are a part.

The effect of time on maternal touch in mother infant free play

One of the most important findings of the research was the decrease in overall maternal touch in a free play context across the first year. Authors of longitudinal studies, who have found similar findings (Ferber, et al 2008; Jean, et al, 2009), have explained this finding as indicative of the changing shape of the relationship between mothers and their infants over time. Specifically, these authors refer to the increased autonomy of the infant and the implication that the infant brings an increasing complexity to their interactions with their mothers. Neither of these studies systematically measured other communicative modalities (such as gaze or affect) to support their theses, but did attest to the variety in the tactile behaviors of the mothers. Whilst the diversity of various maternal forms of active and passive touching, and the locations to which they are directed has been found in this thesis, the articles cited above provided details of the limitations of the application of the findings. Cross sectional designs of longitudinal data by design (Ferber, et al, 2008), do not apprehend stability and change across dyads in a repeated design, and there are limitations when comparing data gathered in a laboratory setting (Jean, et al, 2009), to

that which is examined in naturalistic settings. However, given the limited expanse of literature in the area of tactile communication, both offer supportive explanations for findings within a developmental frame. Interestingly, the suggestion that infant mobility and growing social sophistication are causal agents of this change in maternal communication, are also consonant with the principles of dynamic systems theory. Here a decrease in maternal touch over the first year, not only characterizes the changing organization of the system (dyad), but reinforces the temporality of dyadic interactions "elements of communicational exchange, exist in the gestures, postures and rapidly changing configurations of body movements and adult speech" (Condon & Sander, 1974, p456). However, time did not serve to eliminate touch from the mother's repertoire of interacting, underpinning the growing evidence for touch as a vital ingredient in the lexicon of intimacy and communication. Touching is an intuitive expectation of caregiving – infants are held, supported physically, is nursed, are soothed and rocked – and infants ultimately come to use touch themselves as a way of communicating.

The rates of overall maternal touching in this thesis (42.67% at 6weeks) were lower than other authors report (Stack & Muir, 1990) and closer to others (Symons & Moran, 1987), and this can be interpreted in light of the longitudinal design and perhaps the different population of dyads from which the sample was drawn. This longitudinal design placed no caveats on how mothers interacted with their infants, only with regard to capturing both on a single camera with a reflection of one in the mirror. Mothers were not aware that touch specifically would be measured to ensure the raw data would be as close to naturalistic patterns as practicable. In addition, there are no known studies specifically targeting touch using dyads from New Zealand, and whilst highly speculative, it is possible that cultural factors, not measured in this

thesis, feature in different levels of overall maternal touch. According to Stack (2001) culture specific patterns of touching are communicated through caregiving and communication, and that touch and affect can be communicated differently across cultures (Fogel, Toda & Kawai, 1988). For some authors these cultural differences have been found to centre on the appraisal and expression of the quality of touch rather than global measurements of its presence (Franco, Fogel, Messinger & Frazier, 1996). However it is important from a dialectical point of view to resist drawing inferences from the data in this thesis, but rather focus on context specific information to inform the discussion. There has however been some indication that overall touch and type can be overestimated within an extremely structured experiment (Moreno et al, 2006). These authors go on to conclude that experiments that prescribe the context patterns for maternal touching, even if it is a face-to-face situations, by their nature limit the natural patterns of holding – a primary context for interaction – for dyads and thus interrupt established interaction patterns. These suggestions are particularly relevant for the Still-Face procedure used widely in the evaluation of touch in the intimate exchanges between infants and will be discussed further in a later section.

Importantly, overall touch by itself, does not attest to the complexities outlined earlier. Further, overall duration of touch has not proved to be the best predictor of attachment style or been an indicative measure of individual differences in attachment behaviour (Ainsworth, et al, 1978; Hertenstein, et al 2007). The quality of touch, in particular nurturing touch, on the other hand is more likely to ensure secure attachment status for infants (Ainsworth, et al, 1978; Weiss, Wilson, Hertenstein, & Campos, 2000).

In addition, drawing inferences from duration of overall touch is unlikely to yield fine grain data that might contribute what type of touch is used in particular contexts. This

is particularly relevant when comparing the types and durations of touch in naturalistic play compared with Still-Face studies. The functionalist approach demands this detail to satisfy the context-specific assemblage of social exchange variables that are always multimodal and intersect at the point of communication between mother and child.

With these factors in mind, there are several important aspects of overall maternal touch to apprehend from this study in relation to free play between mothers and their infants. Results are confirmatory of diversity and change over time. Moreover, the prominence of touch in early interactions and its presence across the first year, coupled with a rise in infant touching signifies how touch is embedded in interpersonal exchanges, contributing to the notion of the inseparability of the mother and the infant (Sander, 1987). Within this frame of reference there must be the anticipation and expectation of individual differences and unique expressions of interactive patterns. Differences in background and culture, even if one has taken a representative sample of the population is likely to yield intraindividual differences. These could be welcomed as a sign of the complexity and individual variability stressed by systems theory as evidence for novelty (Thelen & Smith, 1998) and alive communication (Fogel & Garvey, 2007). To this end, it was not surprising to arrive at raw data that met these extrapolates as evidenced in the raw percent duration for dyads and in the large standard deviations. The alternative to not reporting these data, would be to disguise the differences by normalizing the data, thus avoiding an explanation, other than methodological issues, of their presence. Outside the presentation of data on a normal curve, is a discussion of variability, difference or uniqueness. This ubiquitous variability underscores the true nature of social intimacy and must be attenuated at least at a level of both understanding and contradiction.

One of the most obvious explanations for the differences, lies in the homogeneity of the sample. This extends beyond gender, economic or other fixed variables and moves closer to aspects of culture, history and experience. Whilst one can control for the fixed variables, each dyad brings the potential for interaction that has not yet been organized in a longitudinal study. Each step of the data collection process intersects with a time of history and future for the dyad. It unfolds in real time and as such shapes the relationship of the dyad in the present and developmental time.

Also evident from the overall data, was the finding that mean-level differences between 6 and 12 weeks, and 36 weeks and 48 weeks were non-significant. These data suggest stability of touch across the first and last months of the first year of life, but for different reasons. It is well documented that in the early weeks following birth that tactile contact dominates the caregiving process (Carlsson, 1978), and that touch is used differentially by mothers to elicit responsive patterns in infants and maintain mutuality (Landau, 1989). In addition, these notions must be married to the findings from studies of early emotional development that stress touch as an agent to increase smiling and gaze during the still –face period of the Still-Face procedure (Stack & Muir, 1990), that touch can improve infant attention to the mothers face (Stack & Arnold, 1998), that touch plays an important emotion-regulatory role in infant development (Moszkowski & Stack, 2007; Hertenstein & Campos, 2000), and that different touches can elicit and mediate infant emotional displays (Pelaez, et al, 1997). It seems reasonable to assert that in the early weeks infants are being held, rocked, cradled and handled necessitating large amounts of touch in both caregiving and regulatory roles. This is not withstanding the fact that this period is one of intense socialization of the infant which is marked by the arrival in particular of the social smile at approximately 3 months – a milestone of reciprocity and social expression

that can be reproduced to initiate social contact and support shared communication with another. That close contact is more than an adaptive feature of survival or safety but is also concomitant with this socialization process. Infants are held close for several weeks after birth for some authors in the metaphorical sense of the "holding environment" (Winnicott, 1957), for others maintaining proximity to an attachment figure (Bowlby, 1969) and a cradle of understanding (Rochat & Striano, 1999)

The implication for late in the first year, is that these patterns of interactions including touch within dyads is established and can be maintained. Perhaps there is less variability in the amount of touch from mothers, but dyads have established complex ways of being together over time of which touch is a part. This would resonate with other measures of infant development e.g. attachment that are consistently measured at 12 months of age. In addition by the end of the first year, most of the infants typically had a form of mobility (crawling or shuffling) that allowed them autonomy over the environment and thus proximity to their mother. This raises the question for the mother of accessibility to the infant, and the growing reliance on more distal modalities of communication (Ferber, et al, 2008).

The results from this thesis confirm that the period in the middle of the first year shows the most variability with respect to overall touch, and this will resonate later as other results are discussed.

Clearly, overall touch is a useful starting point for beginning the discussion on the utility of touch in mother-infant interactions. Mother's use of touch decreases over time, and has been characterized as representative of the developing and growing child. It is clear from the literature that gaze and voice, without touch decreases infant smiling and gaze at the mother (Gusella, Muir & Tronick, 1988). Touch, as a

communicative pathway is ubiquitous across mother-infant interactions and is both diverse and open to change over time. This raises the question, does maternal touch change over time, or does time, context and individuality alter its expression. To answer these questions it is important to contextualise touch within the communicative array.

The types and locations of touch in this thesis were measured along with gaze and affect as parallel markers of non-verbal communication. Furthermore, changing the context of mother-infant play that was consistent with naturalistic interactions, but would act as a perturbation of the environment, was included to offer insight into how social contact is organized is revealed over time and context.

The main effects of types of maternal touch in mother-infant free play.

All researchers exploring the role of touch in close interactions between mothers and their infants agree that touch is an integral component of the communicative repertoire of dyads. It is ubiquitous across the early developmental period, across cultures and societies, and is part of an envelope of communicative modalities that open onto the world of intimate human exchanges (Stack, 2001). Some commentators conclude that its neglect relative to other modalities is a function of the historical view of the primacy of the visual system in communicative acts, and the complexity in measuring touch (Hertenstein, 2007). Darwin Muir has termed touch as the "forgotten sense" (2002, p95) and in doing so evokes the contradiction that although the skin is the largest organ in the body developmental psychology has been slow to apprehend its significance in development. Given the amount of holding, carrying, bathing, soothing and stimulating mothers carry out with their infants from birth this

situation can only be pondered. Fortunately the upsurge in research exploring the complexity of early interactions of mother's with their infant has arrived at a multidimensional position that demands appreciation of the interconnections of converging data from various fields to build a picture of developmental phenomenon.

In the field of touch research this picture extends into touch as a part of a dynamic process of interactive growth in mothers and infants, and the use of touch within dyads as a means of communicating emotional and affective states, soothing distressed infants, achieving proximity which all hint at the qualitative and quantitative aspects of touch (Hertenstein, 2007).

Body-to-body contact achieves both sensorial connection and signals achievement in proximity seeking. Both of these conditions are critical for encouraging attachment and bonds with others (Aisnworth et al, 1978), but importantly are now known to contribute directly to improved health in at risk dyads – e.g. where the infant has low birth weight or the mother is depressed (Weiss, et al 2000). It is important to reiterate that global ratings of touch or sheer amount of touch, although signaling the mothers availability, are not sufficient to explain the intricacies of how touch is expressed during mother-infant contact.

More importantly the quality of the touch, in particular nurturing touch is now held as key to establishing and maintaining the secure base of the relationship. Here the suggestion is that tender, nurturing and caressing touches are held to signal differences in the way mothers touch their infants (Ainsworth, et al, 1978). Caution against assuming that nurturing touch alone can improve the quality of the primary relationship is offered by some authors (Weiss, et al, 2000), to guard against the assumption that nurturing touch cannot be ill-timed and therefore not communicated

as nurturing touch or that nurturing touch is misplaced and thus negative due to proprioceptive issues in the infant. These suggestions only go to enhance the position that infant or maternal variables can moderate the effects of touch and that the hedonics of touch can differentially communicate emotion.

The decision in this thesis to create two global categories of the type of touch – passive and active was both methodological and sympathetic to the coding system, which inherently established qualities of touch around activity and valence.

Whilst no parallels are to be drawn with operational definitions of nurturing touch that have been used in research, the passive category of this thesis echoes the explication of hugs, caresses, kisses and tenderness in tactile expressivity of mothers. While not specifically analysed in the data, these were identified and coded as part of the coding procedures at 6 weeks and 3 months. It is a limitation of this thesis that they are not made explicit with reference to passive touch, and warrant further attention in the future.

That said, the separations of the two types of touch resulted in the finding that mothers were more likely to exhibit passive touch with their infants than active touch across age (with the exception of 36 weeks free play). Passive touch in terms of the coding schedule, specified such things as touching the infant, and are not the same as but synonymous with, the definitions offered by Jean (et al 2009) and Ferber (et al, 2008) for the Touch Scoring Instrument (Polan & Ward, 1994).

These authors (Ferber, et al, 2008) found that both affectionate and stimulating touch (aggregated from 9 microanalytically coded touch types) decreased significantly over the second 6 months of life, and that affectionate touch was higher than stimulating or instrumental touch at 3, 6, 9 and 12 months. As this cross-sectional data suggests, the

implications for the use of more tender and gentle forms of touch by the mothers are clear. In addition, the authors found that affectionate touch was a significant predictor of dyadic reciprocity. The authors explained their findings with reference to developmental changes in the infant, such as mobility and the growing independence of the child. Moreover, the implication that affectionate touch is associated with synchronous patterns of interactions is further support that affectionate, gentle and contingent touch supports reciprocity and mutuality in infant – mother dyads.

Whilst speculative and outside the scope of this thesis, the implication for massage therapy and the socio-physiological benefits of therapeutic touch become relevant here. The corollaries of this form of touch are increased eye contact, smiling and vocalizations (Paeleaz-Nogeras, et al 1996a) – vital ingredients of interpersonal success and health. Certainly the implication is the use of tender touch in massage therapy and the soothing qualities for the dyad are well recognized (Field, 2002).

The concurrent use of more active forms of touch, even in lower percent durations in this thesis and stimulating touch in the previous study mentioned (Ferber, et al, 2008) indicate that mothers vary their touch across the course of the first year. This diversity can be seen within an organismic frame of reference (Sander, 1962) that heralds the system (mother-infant dyad) as the architect of harnessing environmental stimuli. In turn this leads to flexible adaptive responses that are uniquely configured. Normative data in this regard can subsume this variability.

Infants are stimulated and soothed by their mothers. More stimulatory touches such as tickling, lifting games and shaking of feet, sliding, rocking, have been shown to be effective in increasing attention to another person, and increasing the likelihood that interaction will be maintained (Brazelton, et al, 1974). In terms of stimulation, touch

and other non-verbal behaviors are said to provide critical properties in facilitating regulation of stimuli to infants, and thus encouraging the infant to begin to regulate it's own arousal levels (Koester, Papousek, & Papousek, 1989).

Studies have shown that a profile of touch type and intensity – greater intensity and active touch patterns were used to induce smiling in infants (Stack, et al 2001). In the same study, slow, and more deliberate stroking of the infant was used by mothers during the still-face period, and the authors concluded that different themes in mother-infant play could be more active or passive depending on the goal of the play.

That mothers show flexibility in interactions with their infants is likely to be linked to sharing a range of experiences with their infant, and that dyadic communication varies according to the goal of the dyad and emergence of opportunities that the environment affords. For example, mothers and infants move in and out of a range of environments in the course of their daily routines e.g. doctor, play group, home, grandparents house, supermarket, yet each environment may bear little resemblance to each other (or close resemblance) and the demands on the dyad are both complex and variable. At the very least the environments are rich and varied, as such demand sensitive responses from both members of the dyad (Stack, 2001).

These notions must be qualified by the fact that maternal and infant variables are likely moderators of these features of touch and the effects of different types. For example more poking and tickling have been found to be linked to mothers with depression (Cohn & Tronick, 1989) and the gentle effects of kangaroo care holding has been elucidated for premature infants (Feldman, et al, 2003). Mothers of infants with feeding disorders showed less affectionate touch than controls (Feldman, Miri, Orna & Sam, 2004) and the infants were touch averse. These studies only hint at

infant and maternal effects the relationship between mothers and infants, and how touch can be mediated and affected by the integration of touch with other interactive variables.

In contrast to the dearth of research on specific maternal touch types and data that go beyond frequency data, there is growing evidence for the variants of infant self-touch types, and the expression of these under varying conditions. Infants of depressed mothers use different touch types – grabbing, patting and pulling – when mothers were unavailable in the still-face period (Moszkowski, et al 2009), that infants used more passive (static) touch during normal periods of the still-face procedure (Moszkowksi, et al 2007), self touch has been connected to more passive forms of touch (Moszkowski, et al, 2009.

Interestingly, in the latter study neutral affect co-occurred with passive forms of touch during the still-face period, and neutral affect co-occurred with soothing types of touch in the still-face and normal periods of the experiment (Moszkowski, et al 2009). These data are sufficiently robust because of coding systems that carefully outline, and explicate qualitative aspects of touch – such as type and location – which offer greater depth of information than frequency or overall data.

However the co-occurrence of neutral affect and passive forms of touch, reported in this thesis as the highest forms of touch type and affect used by mothers and infants is noteworthy. This would seem to echo tenets of synchrony, and the integration of affect, gaze and touch indicated in the infant literature. It is worth adding that the naturalistic data of this thesis, not predicated on pre-set matching of individuals, groups or global rating (e.g. depression, maternal sensitivity, dyadic reciprocity represented in the literature), was capable of gathering a body of data that not only

reflects that found in the laboratory, but finds parity with related themes and data from infant studies. Whilst neither of these situations was expected, being the first of its kind to gather systematic naturalistic observational data in this area, the integrity of the process comes to the fore. There is no suggestion here that these parities are imperative for excellent research, merely that cross-data endeavours meet the call for "converging research operations so that we can be more confident about the communicative functions of touch on infants…only with converging research operations can we draw inferences about the communicative effects of touch with confidence" (Muir, 2002, p91).

In his review of the research, Muir (2002), inidcated there was an imperative to "gather descriptive data regarding when and how (both mothers and fathers) use touch to communicate with their infants …a developmental analysis of touch patterns used by adults is definitely warranted" (p90). This thesis has attempted to contribute to this challenge by outlining various aspects of adult touch to infants. However, without an extant literature that has published coding schedules and comparison data, the analytical landscape of this thesis is exploratory and importantly descriptive.

The attempt to meet the philosophical underpinnings of the theories outlined which inform it have provided the impetus to explore touch within the context of mother-infant relationship.

The main effects of locations of touch in mother infant free play

Identifying the locations of touch when mothers touch their infants is a relatively recent phenomenon that has not received much attention from the literature. The Infant Touch Scale (Moszkowski & Stack, 2007) is a recent measure of infant touch that includes the location of the touch as part of the coding schedule. Similarly, the coding schedule which this thesis used, critically included location of touch in the manual which attest to a growing picture of the quality of touch patterns by mothers. The authors of the coding schedule used in the current thesis (Koester, Brooks, & Traci, 2000), reasoned that the location of the touch may have connections to body percepts but importantly add to the variability of the use of touch within dyads. Furthermore, the location of touch is likely to reflect not only a preference for where on the infant's body the mother chooses to touch, but also give insight into proximal features of the interaction. Findings of systematic differences in the location of touch across age were reported in the results and could be explained as part of the integration of touch and other non-verbal indices of communication. The finding that touching the infant's torso persisted across dyads and over time warrants close attention.

Firstly, without a wealth of data to compare these results, the findings are interpreted in light of other variables of interactions that contribute to development over time. It must be stated that the data supporting a preference for touching the infant's torso could be an artifact of the mother's preferences for holding their infants at six weeks (72%) in an en face position (where the head is supported by adjusting the torso into a face-to-face gaze position in supine on the mothers lap/knee). Support of the arms in this position, was achieved by these mothers also. However, it does not fully explain why this pattern of preference for touch location persisted after infants were able to

crawl, sit and get themselves in and out of sitting. It could be that the torso and arms are more proximal to the face and thus advantages the mothers access to the infants face. This position gains further weight when one considers that more passive touch was used than active touch over time, and it is more likely that a soothing touch is likely to be situated on the back or arm of the infant. The increase in head touching late in the first year may add to the picture of the touch as a reassurance of proximity or affirming of effort if this were the case. The torso is an obvious place for tickle games, which offer chase and dodge actions as a source of activity within the dyad (Beebe et al; Wolff, 1963; Stern 1985).

Perhaps, the behaviour of non-human primates gives clues to the phylogeny of touch on the torso. Seminal studies by Harlow (1958; Harlow & Harlow, 1962; Harlow & Zimmerman, 1959) were groundbreaking in their documentation of the effects of comfort contact on clinging behaviour of infant rhesus macaques. It will be remembered that close contact with a surrogate cloth mother was preferable to satiation from food. These findings were discussed in relation to behavioural indexes of emotion that included “frantic clutching” of their bodies during surrogate mother absence suggesting the body of the macaques is critical from a self-touch point of view for expression of distress or at least negative emotionality. Further support for the importance of the torso and body as a critical location of touch can be seen in the literature addressing the grooming behaviour of non-human primates. Grooming or allogrooming as it is called, has been documented as being directed to the back and neck (Hutchins & Barash, 1978, cited in Hertenstein, et al, 2007) and is accepted as a social act that strengthens interactive bonds, performs the function of maintaining health and particularly in breeding females maintains proximity to others maintaining safety. Certainly any touch on the back of a primate serves to reach an inaccessible

part of the body for the individual, however humans typically use the back to stroke, and reassure another individual, a point that will be returned to later.

For mothers the most accessible part of an infants body for lifting and positioning is under the arms and thus combines with the torso. In the early weeks this is a prime source of contact for both the mother and the child and is well documented for survival (Montagu, 1971). Interestingly, parallels with the previous discussion are offered by Montagu (1971) who stresses that hand stroking and caressing are forms of human grooming. Whether one believes that there is a human specific developmental sequence of touching behaviour in mothers, evidence in the newborn period suggests that mothers at least can recognize their infants shortly after birth using tactile recognition alone (Kaitz et al 1993), and the literature on kangaroo care (outside the scope of this thesis) confirm the social, emotional and health benefits of whole body skin-to-skin contact between mothers and their at risk infants (Feldman, Eidelman, Sirota & Weller, 2002).

With regards to the pattern of touch on the torso, the results show consistency or stability across the first 6 months. Mean level comparisons show little variability in the percent duration of touching the torso for the same length of time for the first 6 months. It is likely that this could be consistent with a developmental timetable of mobility, vulnerability and growing independence that has been articulated earlier and put forward by others as a reasonable assertion for age differences (Stack, 2001; Cohn & Tronick, 1988). Indeed infant vulnerability has been shown to moderate the effects of affectionate touch (Weiss et al, 2000).

Early in life infants are dependent on the mother for all care and physical support and protection, and as such mothers use touch frequently to meet these needs. That touch

is all at once social and functional is existential to human development. Unlike other animals who walk and feed within the first hours of life, humans remain captive in mothers (and all caregivers) arms for several months within contexts that the mother by in large chooses. The mother is the child's primary environment and within this frame of reference, the mother and significant others create opportunities for the infant to engage in the social world for which it is well equipped. The nature of a precocious infant and bi-directionality of social presence is pervasive.

Over the second half of the first year, the landscape of touch as this paper is elucidating, appears to change. Results for the location of touch in free play interactions show an increase in maternal touching of arms, head and feet but at different times in the infant's life. While the times may be of significance statistically, the overall pattern suggests increased variability over time and further evidence that mother's investment in social interactions can be characterized by multiplicity and change.

Similar findings using the same coding schedule in dyads where deafness was present for both the mother and child, or just one of them support these results. Increased maternal touching of the head and arms over time was noted at 9 months (Koester, et al, 2000), except in deaf parent of deaf infants where these locations of touch decreased over episodes. When the data was examined across age, there was an overall increase in maternal touching of the infant's hands irrespective of mother or infants hearing status. Very little data has been gathered on the location of touch for maternal touching, but its inclusion in the measurement of this thesis contributes to the changing internal dynamics of the dyads. It is reasonable to assert that increased touching of the infants hands over time could be related to gradual increase in fine motor patterns and the increased manipulation of toys and objects. The implication

being that mothers stimulate the site of infant activity to encourage manual exploration of the environment.

In direct contrast, a study of multiparous mothers revealed that when mothers held their own infant they touched their face and head more frequently in sitting (Kaitz, Zvi, Levy, Berger & Eidelman, 1995). Codes for touching the hands, body, and face/head were provided. However the holding of the infant was reported as part of the coding schedule and included the aspects of movement such as 'change hold', 'adjust position' 'arrange clothes' indicating the variations of movement surrounding early interactions. This supports the notion of this thesis that holding and positioning is a significant factor in the interactive patterns and the justification for remaining cognizant of the variant features of coding schedules that can arise when observing behaviour in naturalistic settings. Given that all mothers were reported as adjusting their position, then the likelihood of this impacting on the child in terms of changed tactile pressure, change in the projection of the warmth of mother skin to another part of the infants body along with potential movement must be considered as part not only of the location of touching but also the type of touching, that sets the backdrop for the landscape of shared communication.

It is when aspects of maternal (and infant) affect and gaze are considered that the complexity of touch within this backdrop must be comprehended. The constant consideration of the meaning of findings from such research, and the apprehension of the notion that these discoveries are snapshots on a continuum of interaction must be met with rigour. The overriding question in this juxtaposition of time and connection must be if touch is part of the social topography of the dyad, what develops? Does touch itself develop over time? Does time change touch? Whilst complex these questions drive at the heart of the growing literature on touch in early social

development and cannot be ignored either in research or in the debates that demand a marriage of research endeavours and their theoretical underpinnings.

The effects of maternal gaze and affective patterns in mother infant free play

The complementarity of gaze, affect, emotion and touch in relational context was postulated by Darwin (1872), a presage of what would come to be understood as the co creation of the dynamics of interpersonal communication and development. The combinations of these conjuncts of interactive behaviour were held as the outward expression of this. For Darwin touch was referenced as an interactive tool linked to the expression of love and affection and that it is through recurring patterns of behaviors that there is a "dovetailing of the infant attachment system and the caregiving system of the adult" (Ainsworth & Bowlby, 1991). To satisfy a systems perspective of this development, there is an imperative to explore development over time and with relevancy to the constructs under scrutiny (van Geert & Steenbeck, 2005). The implication here is that related variables must be explored concurrently. With respect to this thesis there was the motivation to gather interactive data across non-verbal variables to contribute to the literature regarding touch in social development. Several features of nonverbal variables are worth noting, both in relation to gaze and affect.

Face-to-face interactions have served as a gold standard of infant research but importantly highlight how sustained eye–contact between mothers and their infants particularly around 3 months (Hains & Muir, 1996) can have a profound effect on the interactions of the infant with the mother.

Results of this study indicate that maternal gaze changes as the infant ages and as the environmental circumstances alter. The finding that mothers are more likely to look at

their infants face during interactions would seem intuitive. There is clear theoretical and empirical support for this position however the at second glance the circumstances surround gaze patterns is more complex.

Developmentally there are milestones that would account for much of the data including the finding that infants begin to show close eye-to-eye contact with the mother at 6 weeks (Wolff, 1963) and that the emergence of the social smile at 3 months (Tronick & Cohn, 1989) encourage periods of mutual gaze. Maternal gaze at the infant was highest at 6 weeks in this thesis and there was no significant difference between 6 and 12 weeks in terms of mothers gaze at infant. This was in spite of the fact that the positioning of the infant in relation to the mirror varied among mothers in the study.

The indication that dyadic gaze changes over the course of the second 6 months of the first year (Feldman, 2002) was supported by the finding in this research, that maternal gaze at face decreased and showed significant difference at each time point after 6 months of age. Authors have characterized this process as indicating a rise in joint attention or the mutual interest in objects of play. The mutual regulation with an increasingly capable infant – in relation to locomotion, verbal and social skills along with increased ability to initiate interactions – shows a constant adjustment to dyadic change and negotiation. This is particularly relevant to the finding that a concurrent rise in looking at the infants body and an object and decrease in looking at the infants face. This is reflective of differently constructed patterns of gaze and how they change over time.

The picture of the second 6 months of the first year as a period of transition for the dyad is borne out by these data and their affective components.

It seems unwarranted to discuss the gaze patterns of mothers without both their affective displays and *in concurrence with the infant.* To do so would be to invoke the concept of non-emotion and ignore the interrelatedness of one member of the dyad to another. A discussion of the infants affect and gaze will be covered and then drawn together with the mothers in an attempt to discuss overall patterns ***as they relate to touch***. Suffice it to say here that gaze and affect are not seen as separate, but rather as integrated as part of a visual modality of emotional expression.

Maternal affective displays in free play appeared homogenous across dyads. Very little negative affect was expressed by mothers in free play and a revisiting of the negative data on videos suggested that mothers were imitating their child's negative affect and that these occurrences were more frequent in the first 3 months. One explanation for this might be in the process of developing regulatory capacities the dyads are negotiating. The period after birth is arguably a time of great change and adjustment. The infant and the mother combine to navigate the early weeks of adapting to life together, a process that has begun in utero. As Bronfenbrenner (1979) suggests there is a community of concentric circles that envelop the dyad, a community of significant others, culture, society, economics etc that inject influences on infants immediate environment in unique ways.

In relation to affect it is known that positive signaling from the mother is more likely to encourage positive signals from the infant. These in turn encourage attachment to the mother and a secure base on which to attach further experiences. Links to attachment status are made, however more importantly these types of behaviors set up patterns of mutual response and reciprocity.

The high presence of maternal neutral gaze within free interactions is noteworthy. Much of the affect changes in studies involving the exploration of touch have employed the Still-Face procedure to induce changes in maternal affect and measure the effects of emotional unavailability on infant behaviour (Tronick, et al, 1978). Findings have pointed to increased neutral affect and decreased gaze during the time the mothers have a still face (Muir & Lee, 2003). However, little baseline data is offered in these studies as to how the sample of infants and mothers construct their emotional displays prior to the procedure. Even less data exists about the integration of touch with affect and gaze in naturalistic settings. However ,we do know that touch can eliminate the effects of the Still-Face procedure (Stack & Muir, 1990).

From this study it appears that mothers for the most part use a neutral expression when interacting with their infant in free play. This feature of the data must be resolved in terms of the findings from the Still-Face studies which abound particularly for infants in this literature but are essentially dyadic. As robust as the findings are, the potential for an induced Still-Face following a normal period of play, it is possible that the freezing of affect in the Still-Face period is significantly different from a narrower range of neutral behaviour experience that exists prior to the procedure. That another modality of communication – touch - can mediate these effects, not only signals the power of touch in intimacy but also may be reflective of infant lived experience. Whilst speculative it is possible that touch mediates the "still-person' effect as the authors suggest (Muir & Lee, 2003), because decreased gaze or smiling has resulted in increased maternal responding such as touching, or even vocalizing as was indicated earlier. Perhaps infants are expressing and initiating interpersonal behaviors that have their history in dyadic separation and repair engagements (Tronick & Cohn, 1989). Certainly high levels of neutral affect in both mother and

infant found in this thesis would suggest interactive history or baseline naturalistic data is worth including in analyses. Increased pulling at clothes and body, or grabbing the infant seat or gaze aversion has been explained as the infant distracting their attention from the still face or distress at the separation from the parent. However by extending the data to include baseline information, it may be possible to track individual variance across all procedures in responses to the still-face particularly in the often neglected reunion period.

Earlier in this discussion the importance of the convergent data regarding neutral affect and passive touch with infant data and other research was made. This is related to the previous discussion on the effects of the Still-Face procedure on gaze and affect and is particularly salient given the next discussion on the implications for mothers of the perturbation of the environment or the introduction of novel toys into dyadic play.

The effects of condition on maternal behaviour.

This section must open with reference to some aspects of methodology. The introduction of novel toys to mother-infant play was deliberately not counterbalanced for order, because the intention was to introduce a perturbation that was as close to usual changes in the natural environment as possible. That dyads move in an out of environments in the course of their daily routines has been posited. That these environments have novel aspects seems reasonable to assert. Indeed humans - unlike fields of corn, herds of cows, or single cell amoebas – move in and out of complex environments, engage in complex interactive engagements and process complex arrays of stimuli. For infants and their mothers visits to friends, doctors, grandparents, or coffee shops, are likely to place the dyad in contact with novel toys or playthings

that will be offered as objects of interest. Thus a collection of developmentally appropriate toys (based on the Battelle Developmental Inventory, Newborg, 2005), that grew in familiarity and novelty over the course of the data collection period, was felt to have ecological validity and be representative of the lived experience of the dyad. It was expected that the introduction of the toys *following* free play would offer the dyad time to engage with each other as they usually would to gather consistent free play data and then follow up with the perturbation to inject a difference into the environment. This novelty was not expected to be outside the experience of the dyad but would closely follow familiar recurrent patterns of interaction. That this was achieved is testament to the value of naturalistic data and processes that can mirror processes controlled in the laboratory.

There is no inference to be drawn from this perturbation and the Still-Face procedure other than to say that there are parallel differences between infants and their mothers in overall patterns of change. Moreover, the potential to effect change using an ecologically sound method has research possibilities.

The effect on mothers was substantial. In terms of touch there was significantly less touching by mothers on their infants in condition 1 compared with condition two. In addition these differences were more significant between 24 and 36 weeks, than 36 and 48 weeks. In terms of type of touch there was a significant difference between passive and active touch across the second half of the first year but the introduction served to reduce the percent duration of each type of touch significantly. Mother used less touch overall when the novel toys were introduced. This must be countered by the finding that 16 of the 32 participants did not touch their infant at all at 48 weeks during the novel toy condition. This finding, whilst potentially a function of the number of participants in the study could be seen as a real world effect on the

interactions of mothers and their infants. The perturbation resulted in mothers engaging with the novelty of the toys themselves as a potential way of disambiguating the novelty for their child or potentially themselves. It is possible that their own interest was aroused as a precursor to encouraging their child to play with the toy. While not analysed, some mothers did select toys for their infants to play with from the basket, while others let the child choose the toy for themselves. It is possible that this difference in approach infant choice, foreshadows independence in the child, a potential factor for future research. Certainly it might attest to parenting style, a construct of much research and debate (Baumrind, 1991).

One explanation for these findings regarding touch would be developmental. The advent of joint attention (Baron-Cohen, 1995) and the decrease in coordinated gaze (Feldman, 2002) likely signals the developmental shift to a more autonomous infant and the reliance on multimodal forms of communication such as social referencing (Sorce, et al, 1985). This explanation gains weight when one considers the shift in gaze for mothers across the conditions. There was a significant difference between gaze across the two conditions. A decrease in gaze at face from 24 weeks to 48 weeks during free play, was countered by an increase in gaze at the infants body and gaze at an object during the toy play condition. Indeed mothers gazed for longer at an object or the infant's body, than at the infants face in condition 2 (novel toy play). From a developmental point of view, this may reflect the fact that objects become more of a focal point of mother child interaction over the second half of the first year.

Infant fine motor ability, coupled with their increased mobility has been suggested as explanations for the differences found (Ferber, et al, 2008; Jean, et al, 2009). In addition a compelling argument is that the modification of touching patterns with accompanying changes in affect and gaze are representative of the changes in goal

directed behavior of the infant and the dyad. In this regard the infant is able to physically separate or reconnect with the mother by initiating these acts rather than relying on the mother to regulate these situations. Crawling and sitting afford the infant choice and as such control over goals of play and connection to significant other. Coupled with vocal signaling the infant's perceived control over the environment can using multiple modalities contributes to the increased autonomy.

Touch is still used by mothers in their interactions with their infants, but with decreased duration and incident. Differences in gaze patterns are likely indicators of a shift to mothers 'monitoring' of their infants play, which remains all at once dyadic and triadic.

Alternative explanations for the findings could be that infants and mothers were fatigued having already spent time playing together, and that this interrupted their usual patterns of interaction, however if this had been the case, then disinterest would have been expressed in the toys and distance from them may have been expected. This did not appear to be the case for any of the dyads although varying degrees of mobility did affect the infant's accessibility to the toys at 24 weeks particularly.

Thus, with increasing complexity of function comes simplicity of form, that is nonetheless reliant on human multimodal communication. This contradiction, it would seem, is dialectical and implies a lifespan perspective. Touch does not leave our repertoire – we shake hands, kiss, and embrace – as part of our exigent communicative power to connect with others.

Having spent most of the discussion so far highlighting the role of the mother in this thesis it seems almost unreasonable to begin a discussion of their infants. To separate

them on paper is not to separate them in experience but merely to offer clarity around results.

The experience of infants in this study has been attested to in discussion about the mothers. Merleau-Ponty's words that one cannot be touched without touching (1962) ring true here along with Winnicotts (1957) notion that there is no such thing as an infant. An infant exits in relation to another, which in turn defines that person.

After a brief discussion of infant affect and gaze and a reiteration of the experience of maternal touch, a discussion of infant touch patterns will follow. The intention then is to draw dyadic patterns together and discuss them in light of recent research and the implications for future research.

The main effect of infant gaze and affect on mother-infant interactions.

The results indicate changes in patterns of affectual and gaze behaviour in infants across the first year and as a function of condition. That there should be differences in each is not surprising given the already complex picture of interactions that the literature attests to and the apprehension of the ideas that affect and gaze both mediate environmental situations (Weinberg, et al, 1999), and provide qualitative feedback to interactive partners of availability and interest (Lyons-Ruth et al, 1998). In addition, these authors make it clear that how they are used in intimate exchanges is a sign of interactive capability that has been termed "implicit relational knowing" (Lyons-Ruth, et al, 1998). Variability and stability can be seen in this light as a regulating process of achieving this capability. They also attest to a history of negotiation between the

mother and the child in achieving dyadic patterns that are linked to the health of the infant, infant outcomes and the dyad (Feldman & Eidelman, 2004).

Within this frame of reference it is the findings that gaze was more variable over the first year in free play, and that affect remained stable across age that provides information to support these findings. Explication of the synchrony of gaze and affect between infant and mother, was not sought in this study however, synchrony or the temporal coordination of interactional events has been found to have both biological and physiological as well as affective and social correlates. Feldman (2007), suggests that "these findings may be used to train parents to read their infants micro-level signals and respond synchronously" (p344). While it is important to understand the critical implications for intervention and at risk populations of these findings of the predictive power of some social constructs, there is the potential for them to have a quasi-political undertone. It is possible that good outcomes for infants also lie in the understanding of what is within the realm of "ordinary variability" (Fogel & Garvey, 2007). In this study infants used a variety of affect and gaze when they interacted with their mothers. The fact that in the naturalistic setting of their own home infants were more likely to gaze at their mothers face in the first weeks of life and then over the second half of the first year this gaze pattern decreased with a subsequent rise in gaze at an object and the mothers body, is suggestive of changes in attention, and according to some, the growing capacity of the infant to regulate their own behaviour with more distal patterns of behaviour (Hertenstein, 2007).

Several feature of the results pertaining to gaze are worth elaborating. Firstly, the finding that negative gaze is at it's highest for infants in the first weeks of life according to the results, is not only intuitive with regards the amount of infant fussing and crying early in life compared with later weeks, but importantly research indicates

that negative affectual responses are mediated by touch and increased touch can lead to increased affective positivity at 3 months (de Lacey, 1976, cited in Stack 2001). Gaze by itself has assumed a level of primacy in the literature due to its outward measurability, but also because even at birth with limited visual acuity, one of the infants primary source of social information is the mothers voice and face (Crown, et al 2002; Beebe et al, 1997). These authors have found that rhythmic and interpersonal timing between gaze and vocal behaviour at 6 weeks of age. That these are temporally organized it is claimed is substantive information that temporal aspects of these early encounters sit outside discrete expression and form.

In light of all of this it is reasonable to assume the position that the mother is the infants first object of play. Without entering into Object Relations theory, gaze at mother in this frame becomes systemic. It is a symbiotic tool that ensures the early relational needs of both the mother and the child, and signals social alertness for both. That infant gaze at mother decreases across the first year of life is supportive of the position that microanalytic coding of on-off sequences of behaviour in isolated environments can be reductionary of the dynamic processes that unfold in real time (Fogel & Garvey, 2007). Although discrete gaze behaviors were measured in this study, they were patterned over time and in real time. Thus, the outcome for gaze at each time point but in relation to overall development is elaborated. The strength lies in the fact that with decreased attention to the mothers face is a concurrent rise in attention to objects and the mothers body in the second half of the first year. This is likely in part due to the developmental timing of joint attention (Gaffan, et al, 2010) and the shifting focus of the infant into secondary subjectivity (Trevarthen & Hubley, 1978) and coordinated joint engagement (Bakeman & Adamson, 1984).

In terms of this study, there was a preference for infants to attend to the object world in triadic exchanges with their mother, but increased gazing at her body suggests a 'monitoring' of her behaviour as the infant watches the mother play, manipulate and interact with objects of joint interest. It is likely that this monitoring takes on a regulatory role for the infant that disambiguates events and outlines a model of maternal behaviour. That these changes in gaze behaviour are similar for the mother, as outlined earlier, is substantive of this position. Less reliance on face to face gazing (social referencing being a specific form of joint visual attention) between mother and child suggests an integration of interactional processes. That these differences are enmeshed with changes in touch patterns only serves to complicate the interactive lansdcape.

In terms of affect in this thesis the results are different. Findings indicate that infant affect across the first year, and across condition, remains relatively stable, according to the results. Neutral gaze patterns are more likely to be exhibited by the infant during both free play and novel play when interacting with their mothers. The low levels of negative affect for both mother and infant could be explained by the fact that the videos were conducted in their own homes, therefore the dyads were comfortable and in a less distressing environment, or alternatively that mothers were more unlikely to show negative affect in their own home knowing they were going to be on video. Further, a copy of the video was to be returned to them, and perhaps as a record of their child's early life mothers wanted a positive record. Either way, that left only two categories of affect for the bulk of the data to be assumed under. One of the limitations of this was the fact that mothers in the early weeks often used an exaggerated face of the mouth open, eyes widening and a short sharp vocalization. This particular expression was seen in most mothers and had to subsumed under the

neutral code as it was not coded as smile. A reanalysis of this is warranted as it appears to serve a specific purpose of attention getting by the mother. Thus an overestimation of the neutral code was probably completed in the early months in particular. The point being here that infant's experienced a wider range of affectual information via their mother's faces than the coding suggests. Nevertheless, the coding of smiling was reliable and integral to the finding that smiling increased slightly at 12 and 24 weeks, and is supportive of the establishment of the social smile in infants around the second or third month (Feldman, 2002). Here infants are said to gaze for longer, with better visual acuity and with increased smiling. It is possible that smiling is a special expression that is reserved for particular moments of shared connection. It is known that smiling is mediated by maternal depression (Field, 1984) and it is now indicated that touch mediates infants at risk (Feldman, et al, 2003) and physiological distress (Feldman, Singer & Zagoory, 2010). Moreover, according to one author, the "first affective-cognitive structures is the associative bond of enjoyment and the mothers face" (Izard (1994, p304), which is supportive of this claim. Further, the regulating qualities of the smile an expression of positive valency, is likely to build on affective recurrent patterns of interaction that unfold in the future.

The main effects of condition on infant behaviour.

Perhaps one of the most compelling examples of environmental manipulation has been the still-face procedure. It is outlined through out this thesis but is worth revisiting in light of infant behaviour compared across the two conditions. It has been used extensively in recent touch research, and the finding that touch mediates the effects of the still-face has been attributed to the regulatory and communicative

properties of touch (Moszkowski et al 2009). It's power lies in the fact that an alteration in maternal affect following a normal period of interaction alters infant behaviour, both affectively and expressively.

To this end, the perturbation presented in this thesis attempted to follow this tenet. A normal interaction period was immediately followed by the introduction of novelty in the form of toys. It is the introduction of novelty and raised expectations as to how to proceed in the face of novelty that fuels the "relational communication system" (Fogel & Garvey, 2007). These authors suggest that introduction of novelty into the environment leads to modification of interactive patterns and play sequences of actions and coactions, that are emotionally laden with information for the dyad. The assemblage of response patterns in real time are held to herald the arrival of novel forms of interaction that give rise to mutually influential and beneficial patterns of regulated responses. These patterns form a new history of recent interaction, from which new and co-regulated patterns can springboard. This state is constantly changing and being modified as dyads negotiate the landscape of their changing and complex environments.

The results in this thesis of the effects of the perturbation on infant behaviour, supports the above tenets as similar and different changes in infant and maternal responses are revealed. Infants gaze changes – there is significantly more gaze at an object and the mothers body, during toy play than in free play. Attention to novel objects, arguably a natural perturbation and a match for the lived experiences of the dyads, also changed the affect of the infants. While the issues around the category of neutral gaze have been outlined, there was also a concurrent decrease in infant smiling. This serves to strengthen the earlier argument about significance of smiling in interactions coupled with the potentially ambiguous situation of novel forms of

interaction borne out by the introduction of novel toys. Clearly the claim here is that the perturbation was responsible for these changes, however alternative explanations about dyad fatigue, attentional factors and even familiarity with toys presented 3 months before must be considered as contributing factors.

That there were similar findings of change in gaze and affect for the infant as a result of the new condition, is again supportive of interactive variation with complementary features for both mother and child. Whilst speculative, the data suggest a mutuality of change that is dyadically configured. No increase in negative affects was observed during these periods, rather decreased smiling and increased neutral affect signal alterations in expressed affect. That these mirror the mothers responses is noteworthy. Infants gaze direction and affect showed similar patterns across age and condition, indicating changes in behaviour for both in similar directions. These types of changes have been discussed in terms of changes in infant goal directed behavior that reflects their changing goals and needs in interactions (Moszkowski & Stack, 2007). That these goals can be dyadic goals needs to be considered in light of these results. This again moves attention away from discrete behaviors and posits dyadic motives as central to analyses. It is possible that these parallel changes in maternal and infant behaviour characterize the growth in intersubjectivity and less reliance on non-verbal modalities.

The patterns of initiated touch however were different for both the mother and the infant across age and condition in the second half of the first year.

The emergent qualities of infant initiated touch with mother

The limited data gathered in this thesis, regarding infant initiated touch, while not sufficient for more robust testing can be viewed from a systems perspective as emerging from the dyadic landscape of which it is a part. Infant touch has been characterized as an important modality through which the infant can communicate with the mother and thus the mother with the infant (Moszkowski & Stack, 2007). Whilst infant self-touch has been explored with well-developed instruments, far less is known about how the infant uses or develops touch to communicate with their mother. This is lamented by commentators (Hertenstein, 2007), and has been seen as vital to exploring how infants use touch to communicate with others to document a "lexicon" of infant touching patterns (Muir, 2002, p97).

To this end this thesis documented only those infant touching behaviors that were initiated by the infants with their mothers. Whilst there was no hypothesis surrounding how infant touch would emerge, even with this small sample there was evidence that infants used touch to communicate and connect physically with their mothers.

The sequence of touching for infants of approaching their mother, climbing on some part of their body and reaching a face-to-face position at 36 and 48 weeks was not anticipated. That it should be expressed by so many of the infants was surprising, and worth describing in detail as there are similarities with the data coded by Ainsworth and Bell (1970). These authors describe behaviors in infants that are proximity promoting. Included in their analyses, are findings that infants achieve this goal by "approaching and clambering up, leaning and clambering back up" (p55). Further, these authors also took the mothers or strangers behaviors into account when

establishing these patterns as indicative of promoting contact. The importance of context is clear here and suggests positing infant touch within an array of other communicative functions.

In the context of this thesis, that would mean attenuating other variables such as gaze and affect *and* maternal touch, to test the hypothesis that infants do indeed use touch to communicate with others. To elaborate, this would suggest taking cognizance of the fact that the emergence of these patterns are interwoven in exchanges that see greater gaze at an object or the others body for both mother and infant, increased gross motor and mobility in infants, stability and change in affectual expressions *and importantly* a reduction in the percent duration of maternal touch. In this study maternal touch, decreased from around 12 to 24 weeks, to become more stable between 36 and 48 weeks during the free play period. Infant touching of their mother's appeared in some dyads at 36 weeks, and by the end of the first year, 21 of the 31 infants were exhibiting initiating touching behaviour toward their mothers. Developmentally towards the end of the first year more distal channels of communication have ascendency, as an increase in both receptive and expressive language allows symbolic communication. However, it is at this juncture in the current research, that infants initiated proximity to their mothers through direct physical contact. Prior to this infants could reach the mothers hair but these were seen as a function of position rather than initiation.

In summary, the emergence of infant initiated touch, coincided with the stablilization of the lowest mean percent duration of maternal touch at the end of the first year of life.

In addition to the sequence outlined, there was evidence for infants "patting" their mothers (e.g. on the back or arm), while being held in her arms. Patting by infants on themselves during the still-face period of the Still-Face procedure has been interpreted as having a regulatory quality, that soothes the infant when the mother is emotionally unavailable (Moszkowksi, et al, 2009). However, in the context of being held, the patting may be a signal to mother of presence and availability, and hint at the principles of equifinality and equipotentiality suggested by Hertenstein (et al, 2007). Whilst these principles apply to all communicative modalities, with respect to touch they suggest that different touches can be interpreted as having different meanings depending on context. The data in this thesis relating to infant initiated touch is too scant in size and quality to contribute to a full characterization of it's use, but certainly warrants further investigation in the future. Improved understanding of the type of touch infants use and under what conditions could be directly related to the mothers touches, and their form and function.

Further support for an attachment view of the touching of infants can be found not only in the early writings of Bowlby (1969) and the assertion by Mary Main (1990), that in times of environmental exploration or stress, physical contact is said to organize the behaviour of both mother and infant. It could be argued given that the infant touching in free play could have been influenced by the arrival of the researcher – a potential time itself of environmental disturbance and change. In keeping with this it would be reasonable to assert that the promotion of physical contact with the mother – in particular the clambering whole body contact - is the ultimate display of assurance seeking and a sign of attachment to the mother. This is further behavioural support for a sample of infants who exhibit appropriate patterns of development. It could also signal an expectation in the infants that the mothers will be

responsive to their approach given that they have initiated contact – an underlying motive for contact both emotional and physical seem plausible.

Touch and what develops?

One of the questions underlying this thesis is what is touch and does it develop? In light of the results, it seems impossible to separate out the infant from the mother in terms of interactive saliency, and nowhere is this more important than when looking at the role touch plays in communicative arrays. Touching a person inexplicably means you are touched back. Although data from maternal and infant variables were gathered and outlined separately, in this section of the thesis it is time to draw the threads of interaction together to comment on the vocabulary of touch as it is expressed within a context of natural play.

The first comment to make is that the processes of infant development, can be characterized by continuity and change. Yet if there is development what develops? With age, infants change. Unless there are significant underlying issues infants start to sit, to creep or crawl, to babble, make eye contact, smile, and play with objects at various stages across the first year. Where does touch fit into these expressions of a competent infant engaging with others and the world?

The compelling feature of dynamic systems theory, is the view that far from expecting development to come online as part of a biological urgency for change, the patterning over time of interactive behaviour enables a view that particular exigencies

optimize the participation of the infant in processes of organization. These processes of action and co-action feature different modalities of communication that contribute to this process of regulation and organization. Novelty is a key element of these processes providing a juxtaposition of history and future and new opportunities for change.

The emergent properties of the dyad then can be seen in new ways of communicating and of being together. A collection of communicative modalities combine to create a rich variety of tools with which to connect to another, express relational needs, provide security, which in turn feed and nurture the interacting. Early in life these modalities include, but are not confined to, gaze, affect, proprioception, attention and touch.

Touch in this research and in the body of literature that is growing is omnipresent. Mothers touch their infants across the first year and infants have been shown to initiate touch with their mothers in the second half of the first year. Overall touch alone – in frequency or duration - however is an insufficient measure of dyadic functioning. It gains insight into patterns over time, but says little about the quality of the touch. This thesis has cited literature that in investigating touch, has pointed to the use of different types of touch, different locations of touch and their affective attendants and that is suggesting that the amount and type of touch changes over time.

Time was a significant predictor of the amount of maternal touch and the emergence of infant forms of initiated physical contact. In particular, the variability in dyadic interactive behaviour around, and after 24 weeks was obvious at data collection points across variables. Differences in maternal touch type and location, overall touch at this

time point and differences in gaze and affectual behaviors for both mothers and infants, warrants a closer look at potential variables that might explain these patterns.

There is considerable evidence within the developmental literature to suggest that around the beginning of the second half of the first year the interactive world of dyads have changed. This transition is met by the emergence of developmental milestones that afford the infant control over the environment, such as the emergence of the social smile at around 2-3 months (Lavelli & Fogel, 2002), the emergence of pre-speech sounds (Beebe et al, 1992), and the advent of crawling contributes to the control the infant can exert on the environment (Thelen 1994). Suddenly the interactive landscape has changed. The effects of these changes on the dyad go beyond the signaling of the infant or the responsivity of the mother and have implications for the dyad. The decrease in maternal touch patterns of this thesis, is supported by findings that decreases in affectionate and stimulating touch in mothers was significant between 6 and 9 months and no other time period (Ferber, et al, 2008).

Together these findings indicate that far from trying to categorize how touch develops a more appropriate question would be to ask is how is touch expressed across age and under what circumstances. From a systems perspective, this would allow one to consider the contingent behaviors that are attractor states for dyads. That is patterns that dyads are more likely to engage in. For example the finding that infants positioning for example had a direct impact on the overall percent duration of touch, must be considered in light of findings for example that being held or not may have a deleterious effect on mother-infant mutual responsiveness (Van Egern, Barratt, & Roach 2001). This has particular relevancy for the studies of the still-face procedure that follow strapping infants into seats for the process. It is possible that the more active patterns of self touch of the infants such as pulling, patting and grabbing, also

signal that for some infants this is not a familiar context for them, and their touching behaviour in part, is reflective of this.

Early on in the first year, infants experience the close contact with their mother as the primary regulator of the state of the infant and the dyad. The regulation of temperature, feeding and sleeping initially is closely connected to warmth, proximity, care and attention. That infants seek out close contact with their mothers – all infants in this thesis touched their mothers at some stage – in the second half of the first year, has been indicated as the self-regulatory processes developing in the infant (Moszkowski et al 2009). While proximity seeking and gaining behaviors in infants can be seen in this light, it has been found that the critical predictor of mother-infant touch was context of interaction (Brown, Pip, et al 1993). This has parallels with the finding from this thesis that during the natural perturbation period all variables measured decreased in percent duration.

Limitations and implications for future research

While many of the limitations of the study have been highlighted throughout the body of this thesis, one important limitation of the thesis is the homogeneity of sample. The infants were part of families that had parents who were highly educated and lived together (but one), the fathers were in full time employment and the household income for most was stable. That no demographic variables were able to detect differences in individual patterns of touching is perhaps a result of this. This was true for ANOVA and linear mixed modeling where time was the significant predictor of

overall amount of touch. Time in this thesis equated to infant age. No demographic variables including infant gender provided interaction effects however other studies of early mother infant touch also confirm no gender differences in their data sets (Moszkowski & Stack, 2007; Hertenstein & Campos, 2001).

However, even with a narrow demographic, the patterns of touch and integrated modalities in this thesis are consistent with published research in the field, and theoretical postulates on which they are based. The lack of covariance in the data is a starting point for confirming data with more sociodemographically diverse groups. At the very least the data confirm the importance of gathering naturalistic data to broaden the scope on touch research and the need for cross cultural studies to explore patterns of touching.

The sample size was small in this thesis, however the longitudinal nature of the data collection allowed for patterns over time to be reliably accessed. This is a strength of the study, and called for in the research (Hertenstein, 2007; Muir, 2002).

Moreover, while the data is essentially descriptive and trajectories of individual change converged over time, there was confirmation that time showed both stability and change in overall scores. Descriptive data must be a point of reference for a more complicated picture of touch and how it is used in intimate exchanges. How it is expressed within different sociodemographic and cultural populations provides information that can be assimilated into a body of literature that is only in its genesis.

The inclusion of infant self-touch and the use of an object to touch another (observed in the data but not coded, would give a more in depth view of how the mother and infant co-regulate their interactions using objects of interest.

In addition, more work needed to be done on the joint attention of dyads as a way of explaining particular types of gaze patterns that intersect with touch across a broad spectrum of interactions and contexts. The low rates of maternal touch during the perturbation period were confounded by the fact that not many mothers touched their infants during this period – a larger sample size would have allowed a clearer indication as to the effects of this perturbation and is worth pursuing in the further longitudinal research.

The contribution of this thesis to the field is to provide longitudinal data across early infancy that provides contextual information regarding how mothers and infant interact, and the interaction between touch and other communicative variables. All of these points show gaps in the literature and call for investigation.

In answer to the question as to what develops, it is clear that the dyad is the object of change, not touch itself or isolated communicative modalities. Touch is enmeshed in behaviors and patterned interactions that constantly change and adjust to both maternal and infant variables. Touch is integrally involved in the communication of proximity, attention and wider repertoires of connection between mother and infant.

As indicated by this study touch is important in mother –infant communication. It is important that mothers and infants touch each other as part of their evolving relationship. It is integral, and emphasizes the dynamic and reciprocal nature of connecting with each other.

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Table 3 Mean percent duration, standard deviations and medians for all touch types in mother infant free play.

	6 Weeks			12 Weeks			24 Weeks			36 Weeks			48 Weeks		
	$\bar{X}$	SD	Median	$\bar{X}$	SD	Median	$\bar{X}$	SD	Median	$\bar{X}$	SD	Median	$\bar{X}$	SD	Median
Passive	124.83	349.32	91.66	101.62	284.89	57.66	52.87	149.67	16.16	11.64	33.42	2.33	12.38	36.41	1.67
Active (Stimulation)	19.11	54.84	3.88	29.56	27.08	13.66	7.17	20.91	0.00	2.17	6.73	.33	0.00	0.00	0.00
Active (Soothe)	7.67	22.14	2.22	3.78	11.39	0.67	3.20	9.31	0.67	0.45	1.32	0.00	0.41	0.00	0.00
Active (Passive)	1.09	3.30	0.012	4.66	13.64	0.00	4.98	14.37	1.16	0.66	1.96	0.00	0.12	0.00	0.00
Movement	37.89	107.03	19.91	43.25	121.33	20.17	16.71	47.27	7.67	8.11	23.07	2.67	4.49	1.33	1.33

Mother and Infant Research

You are invited to participate in a research project exploring the play and interactions between mothers and their babies. This is a year-long project using video data of mothers and babies at play in their own home. At the end of the project participants will be offered a DVD of the video material providing snapshots of the first year of the child's life.

If you are the mother of a full term baby you are invited to express your interest and request further information by contacting the principal researcher:

Averil Worner: averilworner@xtra.co.nz
University of Canterbury
Ph: 3642 987 ext 3407
Cellphone 027 2456 030

This research has been reviewed and approved by:
The University of Canterbury University Human Ethics Committee and the Canterbury Ethics Committee.

The research is under the principal supervision of Professor Ken Strongman, Pro-Vice Chancellor College of Arts, University of Canterbury.

DRAFT LETTER TO PARENTS AND CAREGIVERS

Psychology Department,
University of Canterbury,
Ilam,
Christchurch.
Ph3642-987 ext3407

Dear Parent/Caregiver,
You are invited to participate in a research project exploring timing patterns in face-to-face interactions. The aim of this research is to investigate timing patterns and rhythm in face-to-face interactions, and how they influence the communication patterns in caregiver-child relationships.

Your participation will involve agreement to have videos taken of you and your child at play in your own home, on at least four separate occasions. These video sessions will be made at a time, that suits you

A short questionnaire (taking about 30 minutes) will also need to be completed.

In return for your participation, you will be given a DVD of the interaction sessions videotaped. If at any stage you wish to withdraw your participation from the project, all data and information supplied by you will be destroyed.

All videos will be stored in a locked cabinet and coded in the Psychology Department at the University of Canterbury. At the completion of the project, videos will be returned to participants on request or destroyed on request. In the event that the data holds particular academic significance videos may be required for other purposes e.g. teaching/further data analysis, however individuals will be contacted for separate consent before this is undertaken.

The results will be reported in a PhD Thesis and may be published in papers or conference proceedings. Anonymity and confidentiality will be preserved by identifying caregiver-child dyads by letter and number code only. The identity of participants will not be made public.

The research is being carried out by Averil Worner, under the supervision of Prof. Ken Strongman who can be contacted on 3667001 ext 6965 and Dr Mark Byrd who can be contacted on 3667001 ext 7194They will be pleased to discuss any concerns you may have about participation in the project.
The project has been reviewed, and **approved** by the University of Canterbury Human Ethics Committee.

Please contact Averil on one of the following addresses to register you interest.
E-mail address: averilworner@xtra.co.nz
University e-mail address: aaw27@student.canterbury.ac.nz.
University address: Psychology Department, University of Canterbury, Christchurch.
Home Phone: 3585851

PARENT CONSENT FORM

PROJECT TITLE: The effects of different patterns of intimate interactions on later social emotional development.

INVESTIGATORS: Averil Worner, Department of Psychology, University Of Canterbury, Christchurch.
Professor Ken Strongman, Department of Psychology, University of Canterbury, Christchurch.

STATEMENT BY PARENT:
I have read and understand the attached information sheet (dated 30 September 2003), for volunteers taking part in a study designed to explore timing patterns in interactions of mothers and their infants. I have had the opportunity for discussion on matters relating to it and I am satisfied with the answers I have been given. I understand that taking part in this study is voluntary (my choice) and that I may withdraw myself, and my child from this study at any stage including all information I have provided.

I fully understand that my involvement in this study is confidential and that no information that could identify me, or my child will be used in any reports on this study. I have had time to consider whether I wish to take part.

I have the details of who I am to contact if I have any questions about the study.
I wish to receive a summary of the results of the research. Yes/No
I give consent for my GP to be notified of my participation in this research. Yes/No
I wish to receive a copy of the video of myself and my child. Yes/No
I hereby give consent for my child to take part in this study. Yes/No

Date: / /
Name of parent/caregiver (please print)_____
Signature: ----------
Researchers: Averil Ann Worner Professor Kenneth Thomas Strongman
Ph 3642-987 ext3407 ph 3642-965 ext 6965
Research explained by: Averil Worner
Project role: Principal Investigator
Signature:----------
Date: / /

DRAFT OF USE OF VIDEO CONSENT LETTER

Psychology Department
University of Canterbury,
Ilam,
Christchurch.

Dear_____,

Thank you for your participation in my PhD research project. As stated at the time of your agreement to participate there was the possibility that the results would yield significant information relevant to a wider audience. This has been the case and it is now possible to isolate elements of the video data to illustrate the importance of timing and other features of face-to-face interactions.

This letter comes to seek you permission for the use of parts of your videos for education purposes and further analysis.

If you are willing, I would like the opportunity to share the particular video clips with you prior to you consenting to this. This would allow you to know precisely the details of the video in question and what information would be highlighted with reference to it.

I am available to come to your home at a time suitable to you to show you the videos or alternatively we could arrange to meet at the University for viewing purposes.

If after seeing the videos and through discussion you consent to the use of the videos in the above ways, then you will be asked to sign a consent form (please see attached).

Please contact me on one of the following addresses:
averilworner@xtra.co.nz
aaw27@student.canterbury.ac.nz
Psychology Department, University of Canterbury, Ilam, Christchurch.

Sincerely,
Averil Worner.

Appendix F: Face-to-Face Interaction Coding Manual

FACE-TO-FACE INTERACTION TOUCH CODING MANUAL

Dr. Lynne S. Koester
Dept. of Psychology
University of Montana
Missoula, MT 59812
USA

TABLE OF CONTENTS

INTRODUCTION

You will be recording parental touches to infants during face-to-face interactions. Specifically, you will be recording the location, type, intensity, and duration of these touches whenever a change in behavior occurs, rather than on a second-by-second basis.

You will be observing parent-child interactions recorded on videotapes. These interactions consist of three phases: episodes 1, 2, and 3. Throughout the phases, the infant sits in an infant seat while the parent sits in a chair directly in front of the infant. During Episode 1, the parent faces the infant, and interacts with him or her for a period of at least 2 minutes. The parent is then instructed to turn away from the infant for a 30-second transition period during which the parent is silent and without expression. The parent is then instructed to turn back to the infant for Episode 2. During this phase, the parent looks at the infant, but continues to be silent and expressionless. This "still face" period lasts 2 minutes. The parent is then instructed to resume interaction for 2 minutes in Episode 3. You will be coding only Episodes 1 and 3.

The episodes are recorded on videocassettes. Most videos include interactions with one infant at two ages, 6 months and 9 months. The videos include the face-to-face interactions you will be coding, as well as other interactions that you will not be examining, such as play with toys. Each face-to-face interaction begins with a view of a white information board. This board displays the subject's name and age. You will compare this information to your subject list to verify the identity of the subject. You may disregard other codes or information indicated here.

As you play the video, you will see a split-screen. One side will display the parent, the other side, the infant. The date of the interaction appears on the lower-left corner of the screen. On the lower-right corner of the screen, three sets of numbers appear. The first two represent time in minutes and seconds, respectively. The third represents the current video frame (30 frames = 1 second).

You will use a coding sheet to record the touches you observe. A sample is provided on the next page.

SAMPLE CODING SHEET

FACE-TO-FACE INTERACTION: TOUCH CODING

SUBJECT: _____

AGE: 6 mos. 9 mos.

CODER: _____

EPISODE: 1 2 3

START TIME	TYPE OF CONTACT	LOCATION ON BODY	INTENSITY/ QUALITY	END TIME	DURATION

THE PROCESS

1. Find the Correct Section of the Video

Most videocassettes will have recordings of a subject at more than one age. Therefore, you will need to find the section of the video which contains the subject at the age that you are examining. The labels on the videotapes indicate 6 and 9 months, or only 9 months. If the tape includes both ages, the 6-month interaction will be at the beginning of the tape, and the 9-month interaction will usually begin 20-30 minutes into the tape (as indicated on the VCR timer). You can find this section by using the search and fast forward controls on the remote control. Each recording begins with a white information board. Compare this information to the subject information you have been given in order to verify the subject and his/her age.

2. Play the Video at Full Speed

Beginning with the information screen, play the video at full speed through all three episodes to determine if the video is useable. Specifically, watch for the following:

Researcher Interference
Does a researcher enter the room (other than to indicate the beginnings and endings of episodes) to move the video camera, talk to the parent, or otherwise interrupt the interaction? Unless this interruption is very brief, DO NOT code the episodes.

Working Timer
Are the minute, second, and frame counters all working? Are any of the counters consistently difficult to read? If so, DO NOT code the episodes.

Video Quality
Is the picture clear or is it dark and grainy? If it is difficult to see the details of the interaction, Do NOT code the episodes.

Subject Positioning
Is the subject positioned such that you can see his/her entire body? Sometimes a parent obscures one of the infant's legs or another body part. This is acceptable and to be expected. However, if you think that a significant portion of the infant is not visible or you are unsure, DO NOT code the episodes.

Complete Episodes
Some interactions are incomplete due to the parent removing the infant from the infant seat. If there is less than 2 minutes of interaction in either Episode 1 or Episode 3, DO NOT code the episodes.

If you find any of the problems listed above, make a note of the problem and go on to a new subject. Your research supervisor will review the video and determine whether it should be coded.

3. Notice General Intensity Level of Touches

As you watch the video at full speed, notice the general level of intensity of the touches. Are this parent's touches more or less intense than the touches of other parents you have observed? You will not need to record this general impression, but should keep it in mind later when you are assigning intensities to individual behaviors. If your general impression is that this parent's touches are more intense than the touches of other parents you have observed, then you will assign higher than average intensities. BUT REMEMBER, you are determining the intensity of touches ONLY. The intensity of the parents' vocalizations and facial expressions, and the infants' reactions to the parents should NOT be considered.

4. Find the Start Time for Episode 1

To find the start time for Episode 1, you must first find the end of Episode 1. Find the point at which the researcher indicates to the parent to stop interacting and turn away from the infant. Note the earliest point at which you can tell the researcher has entered the room. You may do this by listening for the researcher's voice or watching for the parent's response. Rewind the video 2 minutes. Then further rewind it to the nearest second. For example, if you first hear the researcher enter the room at 4:27:16, you should rewind the video to 2:27:00. This is your start time. Record it at the top of your coding sheet. This will be your start time even if there are not any touches to record until later in the interaction. You will code 2 minutes of behavior. Therefore, if your start time is 2:27:00, your stop time will be 4:27:00. This will be your stop time even if a behavior that began before the stop time extends beyond the stop time. For example, if a parent shakes a subject's hand from 4:23:02 until 4:28:04, and the stop time is 4:27:00, you will record the end time of that behavior as 4:27:00 rather than 4:28:04, and the duration of the behavior as 4 seconds rather than 5 seconds.

5. Find the Start Time for Episode 3

To find the start time for Episode 3, find the point at which the parent turns back to the infant to interact after having been given the signal by the researcher to end the "still face". Your start time will be the nearest second after the parent has turned back to the infant. For example, if the parent acknowledges the researcher's instructions, and then turns back to the infant at 8:03:14, your start time will be 8:04:00. Record this time at the top of your coding sheet. As with Episode 1, this will be

your start time, even if touch behaviors do not start until later in the interaction. You will code 2 minutes of interaction. As with Episode 1, coding is ended after 2 minutes, even if touch behaviors extend beyond that time.

6. Code the Episodes

Using the guidelines provided in this manual, code the episodes. If you are having difficulty coding a section of an episode, leave a portion of your coding sheet blank and move on. After you have reached the end of the episode, return to the problem area and try again. If you are still unsure of how it should be coded, ask your research supervisor to look at it with you.

7. Check Your Work

Watch the episodes at full speed while reviewing your coding. Pay special attention to the TYPE codes that you have assigned. Since behaviors may appear differently at full speed than at slow speed, you may catch errors in coding during this review. Also notice the actions of the parent's nondominant hand, and pay special attention to both sides of the screen. By doing this, you may observe behaviors that you initially missed.

8. Note Difficult Interactions

If you find an interaction to be particularly difficult or frustrating to code, please make a note of the nature of the problem. Your research supervisor will review these notes.

GENERAL CODING GUIDELINES

In coding these videos, you will be recording instances in which a parent touches his or her infant. Therefore, there are several types of behavior which **you will not be coding**, including the following:

Indirect Stimulation

Do not code behaviors which stimulate the infant indirectly. (For example, shaking the infant's chair or blowing on the infant.) For a behavior to be coded, the parent must touch the infant with either the parent's own body, or an object.

Infant-Initiated Touches

Do not code behaviors which are obviously infant-initiated, and to which the parent does not respond at all with touch. (For example, an infant rests his hand on his mother's arm, and the mother does not respond by moving her arm.)

You **will be coding** the following types of behavior:

Indirect Touches

Do code behaviors in which the parent uses an object as an extension of his/her own body in order to touch the infant. This would include, for example, the parent brushing the infant's face with a sock, or tapping the infant's leg with a rattle. This would not include, however, behaviors such as incidental brushing of the parent's sleeve against the infant, since this would not be an instance of the parent intentionally using the object as an extension of him/herself.

Parent-Initiated Touches and Responses to Infant-Initiated Touches

You will code each touch which is initiated by the parent. You will also code touches which are initiated by the infant, but to which the parent responds with touch by, for example, providing resistance, helping the infant make the touch, or clearly inviting the touch. Consider the following examples:

> An infant is holding on to her parent's hand. When the mother tries to pull her hand away, the infant holds on and is, therefore, pulled forward.
> **Code as though the parent moved the infant's hand.

A parent holds her hands out, inviting the infant to slap or kick them. The infant does.
**Code as though the parent initiated the touch.

An infant grabs her parent's hand and rapidly moves it. Although the infant is the primary actor, the parent seems to be producing some of the movement.
**Code as though the parent moved the infant's hand.

Determining whether a parent has responded to an infant-initiated touch can be very difficult. When in doubt, assume the parent is the initiator. Start timing these behaviors at the first point at which the parent seems to be responding.

You should not be concerned with parent motives. Therefore:

Intent Should Not Be Considered

For example, if the parent were to tap the infant's foot and the tap caused the foot to move, this would be coded as a movement even though the parent may not have intended to move the foot. Likewise, if the parent were to lean in to kiss the infant on the forehead, and in doing so were to touch the infant's legs, both locations would be recorded, even though the parent may have intended to touch the face only.

Games Should Be Regarded as Sets of Independent Behaviors

When you observe game behavior, you should code the individual behaviors within the game, rather than coding the game as one long behavior in itself. For example, "Patty Cake" would be coded as a series of clapping, patting, and moving behaviors. The parental intent for those behaviors to be related should be disregarded.

Touches in Response to Immediate Physical Need Should Not Be Coded Any Differently

Occasionally, a parent must touch his/her infant in order to respond to physical needs (hearing aid requires adjustment, infant needs nose wiped, etc.). Despite that the motives of these touches are different than other touches you will record, they should not be coded any differently.

LOCATION ON BODY

Codes

In the LOCATION column of the coding sheet you will record the parts of the infant's body being touched by the parent. Use the following codes:

T - torso
H/F - head, face or neck
F/L - feet or legs
A/H - arms or hands

You will list all locations being touched at one time. For example, if the parent were to simultaneously shake one foot and one arm, you would record A/H, F/L. It is possible for all four locations to be touched simultaneously.

Change in Location

If there is a change in the location of a touch within a code area, you should not code the change as a new behavior. For example, if the parent were to rub the infant's arm and then move down the arm and rub the infant's hand, this would all be coded as a single behavior.

If, however, there is a change in location to a different code area, or a touch to another code area is added, you must code this as a new behavior. For example, if the parent were to tap the infant's torso and then move down and tap his leg, this would be coded as <u>two separate behaviors</u>. Likewise, if the parent were to move the infant's leg, then move the infant's hand, while continuing to move the infant's leg, two behaviors would be coded. The movement of the leg alone would be coded F/L. The movement of the leg and the hand together would be coded F/L, A/H.

Exception - Occasionally you may observe a parent changing locations so quickly that it would be very difficult to separate the behavior into individual touches. In these cases, you should code the event as one behavior, as though the various locations were being touched simultaneously.

Locations Stimulated But Not In Direct Contact

You should record only those parts of the infant's body which are being directly touched by either the parent's body, an object the parent is using as an extension of his/her body, or the infant's own body (as when a parent uses the infant's hand to pat the infant's leg). You may notice other locations on the infant's body being stimulated by touches. For example, if the parent

were to grab the infant's arms and pull him forward in the seat, his torso, head, and legs would be moved in addition to his hands. Since these body parts would not be in direct contact with the parent, however, they would not be included in your list of locations touched.

TYPE OF CONTACT

Codes

In the TYPE column of the coding sheet, you will record the type of touches you observe. Use the following codes:

1 - passive
2 - active
3 - active/passive combination
4 - movement

1 - Passive

A touch is passive if: 1) the parent does not move his/her point of contact with the infant for 1 second or longer, and; 2) the parent does not move any part of the infant's body for 1 second or longer. Resting a hand or arm on an infant is the most common situation which is coded as passive. However, the following examples also qualify as passive touches: 1) For at least 1 second, a mother holds up her infant's leg, but does not move the leg and does not move her hand along the leg. 2) For at least 1 second, a father holds his hands in one place on his infant's face while playing "peek-a-boo."

2 - Active

A touch is active if: 1) the parent is moving his/her point of contact with the infant, or; 2) the touch is less than 1 second (a tap). The following behaviors are a few examples of active touches: tapping, kissing, adjusting clothing, stroking, and tickling.

3 - Active/Passive Combination

This code is used when the parent is simultaneously touching the infant passively and actively. Parents will frequently rest their nondominant hands on the infants while actively touching the infants with their dominant hands. Another example of this type of touch is a parent holding up an infant's leg while kissing the infant's foot.

4 - Movement

This code is used for any touch which moves a part of the infant's body.

Combination Touches Other Than Active/Passive

When the parent moves the infant while touching the infant passively or actively, **only the movement touch is coded.** The

passive, active, or active/passive touches which are taking place simultaneously should be completely ignored. For example, if the parent were to tickle the infant's torso while moving his leg, the only code used in the TYPE OF CONTACT column would be 4 (moving), and the only code used in the LOCATION column would be F/L (feet/legs).

Tap-Signs

A frequent type of active behavior displayed by deaf parents is the tap-sign. The parent quickly taps the infant (the touch is usually less than 1 second), and then signs to the infant. The tap is most frequently directed to the infant's torso, although it may be to any part of the infant's body. These behaviors are coded as any other active touches would be, except that the coder notes the tap-sign by printing "TS" in the margin next to the observation.

Pauses in Behavior

Each time there is a change in the type of contact, you will record the touch as a new behavior. For example, if the parent were to tap the infant's arm and then stop and rest her hand on the infant's arm, you would code the rest as a new behavior. This is the case except in instances in which there are brief rests (less than 1 second) in the active or moving behaviors. In these cases the pauses are considered transitions, and are not coded separately. For example, if the parent were to move the infant's leg for 3 seconds, then pause for 3/4-second, and then move again for 5 seconds, you would record that a moving behavior occurred for 9 seconds, rather than recording three individual behaviors.

Timing a Movement

For timing purposes, a movement <u>includes</u> the time required to gain a grasp on the body part that is to be moved. Therefore, if a parent takes 2 seconds to grasp an infant's arm before moving it, this 2-second period is added to the time of the movement, rather than being recorded as a separate behavior. If the parent had been passively touching the infant before moving her, it can be difficult to determine when the grasp began. By playing the video at full speed, you will be able to make this distinction more easily. Likewise, a movement includes the time required to release a grasp. To distinguish this from a passive touch, watch the behavior at full speed.

Tips for Successful Coding of Type of Contact

1) Watch the parents' nondominant hands. Parents will often rest these hands on their infants while using their dominant hands to sign or actively touch the infants.

2) Watch both sides of the screen carefully. You will usually be watching the side of the screen which displays the infant. However, this picture often gives an incomplete view of the infant, making it difficult to see touches to one side of the infant's body.

INTENSITY

In the INTENSITY/QUALITY column of the coding sheet, you will record the intensity of the touches you observe. Use the following codes:

1 - gentle to moderate touches
2 - moderate to forceful touches

Judging intensity may be the most difficult aspect of coding, since few rules are used to guide the coding of this characteristic. You will have to learn, through experience, what kinds of behaviors are coded as gentle, and which are coded as forceful. The following is a list of qualities of the touches that you may look for when determining the intensity of a touch. Remember that these are only general guidelines, and not rules.

Speed of a Movement - The faster the movement, the more intense.

Distance of Movement - The larger the movement, the more intense.

Degree of Extension - The greater the degree of extension, the more intense. For example, holding an infant's foot up over his head is usually a more intense behavior than holding his foot up only 2 inches above the infant seat.

Strength of Grip - The stronger the grip, the more intense.

Skin Indentation - The deeper the skin indentation, the more intense. For example, resting a finger on an infant's abdomen is generally a less intense behavior than pressing in the abdomen 1/2 inch.

Abruptness - The more abrupt, the more intense. Sudden bursts of behavior are generally more intense than fluid behaviors.

Stimulation to Body Locations Not Being Touched - Although, you will only record those locations on the body actually being touched, you should consider whether a touch stimulates other parts of the body when determining the intensity of the touch. For example, if a mother were to pull forward her infant's hands and only the infant's hands were moved, this would not generally be as intense a behavior as if the mother had pulled the infant's hands and the infant's entire body was pulled forth in the seat.

Initiation- As discussed in the GENERAL GUIDELINES section of this manual, when a parent responds, even slightly, to an infant-initiated touch, the touch is coded as if

the parent had been the initiator. For purposes of determining intensity, however, it is valuable to notice whether the parent was solely responsible for the touch, or was only responding to an infant-initiated touch. For example, if a father were to invite his infant to slap his hands, the resulting touch would generally be considered less intense than if he had slapped the infant's hands.

Remember that you are coding touch behaviors only. Parental vocalizations and facial expressions and infant reactions SHOULD NOT be considered when assigning intensities.

Change in Intensity

If you observe that a behavior changes intensities (from gentle to forceful, or forceful to gentle), and the behavior should not be divided according to any of the coding guidelines (change in location or type of contact, for example), watch the behavior at full speed. If the intensity change is obvious when you play the video at full speed, break up the behavior to account for the intensity change. If the intensity change is not obvious, however, do not divide the behavior. Rather, assign the intensity which seems most salient at full speed.

DURATION

In the DURATION column of the coding sheet, you will record the duration of the behaviors you observe. To calculate the duration, find the difference between the start and end times. If this interval is less than 1 second (30 frames), record <1 in the duration column. If it is greater than 1 second, round to the nearest second. (1-15 frames rounds down, 16-29 frames rounds up)

Examples:

Start Time	End Time	(Difference)	Duration
3:04:07	3:05:03	less than 1 second	<1
5:16:28	5:18:04	1 second, 6 frames	1
2:51:03	3:02:19	11 seconds, 16 frames	12

FACE-TO-FACE INFANT AND MOTHER TOUCH AND NON-VERBAL BEHAVIOUR CODING INSTRUCTIONS

Introduction

For the purposes of coding the data you will be recording maternal and infant touches and other non-verbal behaviours during face-to-face interactions. More specifically the location, the type, and the intensity of the touches will be recorded on a second-by-second basis.

You will be observing mother-infant interactions that have been recorded on a digital camera and 3min or 5-min sections have been selected and these data entered into a computerized program – VCode.

The VCode system allows you to record second-by-second observable aspects of the interaction as they occur. It allows for multiple codes within the same second that will be outlined later in these instructions. Training in the use of the VCode program and the Coding protocols will be provided, using data from mother-infant interactions not used for research purposes, until you are familiar with them.

As you play the video you will see that there is a mirror placed behind the infants head/body. This allows you to see the mothers face reflected in the mirror and the infants face recorded on the video simultaneously. It is recommended that you play all videos through at full speed prior to coding to familiarize yourself with the context of the interaction.

You will record the all behaviours you observe on the VCode program using the pre-programmed coding schedule. A sample of a VCode output is provided on the

following page. All coding on a single dyad is to be continuously coded until complete.

Coding procedure

A. Locate the video to be coded.

Prior to your coding a list of dyads for you to code will be provided. These dyads can be located by name on the desktop of the computer. All you need to do is click on the appropriate name and the interaction sequence to be coded will open up immediately in VCode. The video automatically opens up at the beginning of the video so there is no need to adjust the settings. In addition the selection of codes are located on the right hand side of the viewing box – again there is no need to adjust any of the codes.

B. Play the video at full speed.

Click on the play button directly under the video box to play the video at full speed. Check: 1. That the video plays all the way through (3mins or 5mins).

2. That the quality of the video is clear

3. That the lighting in the room provides clear observance of the data

If any of these conditions are not met please contact the researcher immediately.

C. Code the Video Data

Using the Coding Protocols provided in these instructions, code the data on four separate pass throughs of the data. On the first pass through code all data relating to touch for the mother i.e. Advance each second of the data according to training using the arrow buttons on the keyboard and code using letters/numbers on the keyboard as outlined.

It is important to note that if you are unsure as to how to code a particular section of the data, while VCode allows you to review pre-coded seconds of data, rewinding the video removes coding beyond that point. It is more practical to code each second in sequence. Particularly difficult to code data can be discussed with the researcher so that consensus can be reached.

Individual codes within a second however can be added or deleted. This can be achieved by moving back second-by-second in time until the appropriate section in the data.

In addition the video can be replayed in slow motion for further checking procedures. This is important as you may observe behaviour that you missed during coding.

A selection of data will be re-coded by another person, to check that inter-rater reliability remains high.

Once the coding has been completed save the work by pressing save, exit the work and open another dyads file to code those data.

Coding Protocol: General comments

As you code these videos you will be recording instances of behaviour that include the location, type and intensity of touch behaviours within a second that are initiated by the mother *and* the infant.

In addition you will be coding maternal and infant gaze behaviour, global measures of mother and infant affect and provide a rating on a global measure of dyadic interaction.

Specifically there are two major categories of touch behaviour that you will be asked to carefully code – **mother initiated touch with infant** and **infant initiated touch with mother**. Both of these categories must be coded on what is observed without reference to how the other interactant responds. For a touch behaviour to be coded the mother must touch the infant, or the infant must touch the mother with some part of their own body or with an object.

Mother and Infant initiated touch

Code all behaviour in which touch is observed. The following examples may be included:

- The mother taps the infant with a rattle
- The infant rests his/her hand on the mothers leg
- The mother kisses the infant on the foot/hand/face/tummy
- Infant grasps mothers hair/face/mouth
- Infant pushes mothers hands/face/legs away
- Mother uses objects repeatedly to play games

Games

All instances of touching behaviour within games should be coded as separate touches. For example "Getcha" games would be coded as a set of tickling, holding, patting and moving behaviours rather than a game of touching. Again code only the actual touching behaviours rather than the intent to touch

Need

All instances of the mother touching the infant to meets his/her physical need must be coded in the same way as all other touches. Wiping an infants nose, wipe face, or pulling the infant from danger e.g. electrical equipment, must be coded as touch without regard to the functional nature of the touch itself.

CODING PROTOCOLS

LOCATION

Four of the codes on VCode refer to location or the part of the infant's body that is being touched by the mother and the part of the mother's body that is being touched by the infant. Use the following codes on VCode:

T/t – Torso

H/F or h/f – head/face/neck

F/L or f/l – feet/legs

A/H or a/h – arms/hands

The VCode allows you to record multiple touches within the same second so it is important that all touch locations are recorded for each second.

If the location changes then a new location must be coded. For all example if the mother touches the infant's arm and rubs down the arm to the fingers this is all the same location.

If the mother were to kiss the infant on the mouth then bend down to kiss the infants toes then another location must be coded.

It is possible that the infant or the mother could touch each other within the same second at different locations. An infant could reach to touch the mother's hair with one hand and at the same time rest the other hand on one of her legs – it is important that both of these locations are coded – the codes would be H/F and F/L for that particular second.

Even if other body parts are moved within the context of the touching e.g. if in pulling the infant to stand the mother moves the torso and the legs, only those body parts directly touched by the mother would be considered when coding the location of the touch.

A no location code is to be entered if no touch behaviour is evident.

TYPE OF TOUCH

There are four codes on Vcode that refer to the type of touch that the infant uses when touching the mother or when the mother touches the infant. Use the following codes on VCode:

P/p - Passive

A-Stim/a-stim – Active – Stimulatory

A-Soothe/a-soothe – Active -Soothe

A/P or a/p – Active/Passive combination

M/m – Movement

N – No touch

Passive

A static touch is to be coded when the mother/infant does not move his/her point of contact with mother/infant for more than 0.5 of any second. An example of this would be resting an arm on a body part, holding a leg or arm, infant resting his/her feet on the mothers legs while lying on floor or mother holds hands over infants eyes while playing 'peek-a-boo". These behaviours could last longer than one second but can be coded for each second they are occurring as long as they last more than 0.5 of any one second.

Active – Stimulatory (A-Stim)

For a touch to be coded as A-S, the mother or the infant has to have a moving point of contact. The following behaviours would be considered A-S:

- Tap
- Pat
- Poke

- Tickle
- Pull
- Grab
- Squeeze
- Short kiss

It is important to note that A-Stim touch behaviours may occur multiple times within a second. One code for A-Stim touching per second will meet the coding requirements of the study.

Active-Soothe (A-Soothe)

For a touch to be coded as A-Soothe, the mother or the infant has to have a moving point of contact that have a calming or quieting quality. The following behaviors would be considered A-Soothe:

- Stroke
- Caress
- Wipe
- Rub
- Long kiss
- Cheek-to-cheek rub

It is possible as in A-Stim behaviors that A-Soothe behaviors may occur multiple times within a second. One code for A-Soothe will meet the coding requirements of the study.

Active/Passive

This category is to be used for those behaviours where the mother/infant is touching the other both passively and actively. This combination is possible for example when

the mother rests one hand on the infants leg while the other is actively tickling or stroking. A further example is when the mother holds up the infant's leg and kisses the infant's foot. An infant initiated example would be when the infant pulls to stand and holds the mothers body with one hand while actively stroking her hair with the other hand.

Both of these types of touch should be coded if they occur in the same second. Again these behaviours may continue across a number of seconds but must be coded in each second they are observed. A defining feature of this category is that each hand is involved and that both behaviors of either A-Stim or A-Soothe combine with passive touch.

Movement

This code is to be used for any touch behaviour that moves any part of the mother's or infant's body. Sometimes the mother will move the infant to a different position and this touch would constitute a movement code.

Similarly an infant may grasp the mother's hand and begin waving it

The following behaviors would be considered M/m:

- Lifting
- Waving
- Shaking
- Positioning

Determining who initiated the movement may be difficult and if in doubt defer to the mother as the initiator. It may be that both simultaneously began the movement or that it is not possible to be sure whether the mother or infant began the movement. In these cases it may be possible that the audio will give clues or that even in discussion with the researcher that a consensus cannot be reached. In these cases code as mother initiated.

INTENSITY OF TOUCH

There are only two codes with regard to intensity of touch. Use the following codes on VCode

G/M – gentle to moderate touches

M/F – moderate to forceful touches

You will be asked to make a judgment as to the quality or intensity of the touches you observe. Whilst this may not be as clearly defined as location and type of touch this issue will be addressed in training.

In addition there are qualities of the touch behaviours that may assist you in your coding decision. Consider the following:

1. **Speed** of the touch movement – the faster the speed the more intense
2. **Size** of the movement – the larger the movement prior to contact the more intense e.g. mother looms into infant prior to tickle, infant pulls mother's hair as opposed to stroking it.
3. **Impression** – how far the mother or infant extend their touch into the body of the other e.g. during a tickle the mother may push deeply into the infant's tummy or lightly brush the outside.
4. **Sudden** movements to touch would suggest the more sudden the more intense e.g. the infant may slap the mother on the face as part of play without the mother expecting it.

These qualities relate to touch behaviour only and only one of the two intensity codes may be applied to one touch behaviour within one second. It is possible that the touch behaviour will span more than one second and the intensity of the same touch behaviour changes over time. Playing the video at full speed may help in determining the exact code to be used in this case. Failing this consult the researcher so that through discussion and consensus any disagreements may be resolved.

GAZE – MOTHER and INFANT

Five codes on VCodc refer to gaze or looking behaviour for the mother and five codes (the same behaviours) refer to looking or gazing behaviour of the infant. The definitions of the codes are the same for the infant and the mother but are coded separately. All categories are mutually exclusive i.e. only one code can be used per second for the mother and for the infant.

Please enter the following codes on VCode:

Mother Gaze

F – looking at infants face

B – looking at any part of the infant's body other than the face

O – looking at object

A – gaze is averted

U – un-codable in this second

Infant Gaze

f – looking at mother's face

b – looking at any part of the mothers body other than the face

o – looking at object

a – gaze is averted

u – un-codable in this second

AFFECT

There are three codes on VCode that apply to the affect of both mother and infant. Affect can be defined as the expressive displays of the face. As such three codes – neutral, smile and negative -- have been chosen for you to code for each second for both the mother and the infant. A fourth code – un-codable has been added for those seconds where for more than 0.5 of the second one member of the dyad has their face obscured.

Please code according to the following codes (the mothers code is in upper case letters the infants in lower case letters):

N/n – neutral

S/s – smile – for a smile to be coded the mouth had to be upturned whether the mouth was open or closed.

N/n – negative

Similar to INTENSITY this category may require more practice and discussion than other categories for accurate coding.

The Infant-Toddler Social & Emotional Assessment-Revised (ITSEA) ©
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Section A:
This section contains statements about 12- to 36-month-old children. Many statements describe normal feelings and behaviors, but some describe things that can be problems. Some may seem too young or too old for your child.

Directions:
For each statement, please circle the answer that best describes your child in the **LAST MONTH**.

0:	Not True	or	Rarely
1:	Somewhat True	or	Sometimes
2:	Very True	or	Often
N:	No opportunity		Child has never had the chance to behave this way.

Example: **"Quiets if given a bottle."** **0** **(1)** **2** **N**
N would mean that your child has not used a bottle in the last month.

TODAY'S DATE: _____/_____/_____

0 = not true/rarely **1 = somewhat true/sometimes** **2 = very true/often**

Please choose the answer that best describes your child in the LAST MONTH:

1.	Is bothered by loud noises or bright lights	0	1	2	
2.	Takes a while to feel comfortable in new places (10 minutes or more).	0	1	2	
3.	Gets hurt so often that you can't take your eyes off him/her.	0	1	2	
4.	Acts aggressive when frustrated.	0	1	2	
5.	Is quiet or less active in new situations	0	1	2	
6.	Gets upset when left with a new baby-sitter. (N: Never used babysitter).	0	1	2	N
7.	Responds the first time his/her name is called.	0	1	2	
8.	Shows pleasure when s/he succeeds (For example, claps for self).	0	1	2	
9.	Puts toys away after playing.	0	1	2	
10.	Seems nervous, tense or fearful.	0	1	2	
11.	Is restless and can't sit still.	0	1	2	
12.	Gets very "wound up" or silly when playing.	0	1	2	
13.	Acts bossy.	0	1	2	
14.	Is constantly moving	0	1	2	
15.	Dislikes some foods because of how they feel.	0	1	2	
16.	Follows rules.	0	1	2	
17.	Is bothered by certain odors (smells).	0	1	2	
18.	Wakes up at night and needs help to fall asleep again.	0	1	2	

0 = not true/rarely 1 = somewhat true/sometimes 2 = very true/often
Please choose the answer that best describes your child in the LAST MONTH:

19.	Gets upset when left with a familiar baby-sitter or relative. (N: Have not used a sitter/relative in the last month)	0	1	2	N
20.	Quiets down when you say "Shh".	0	1	2	
21.	Cries or tantrums until s/he is exhausted.	0	1	2	
22.	Refuses to eat foods that require chewing.	0	1	2	
23.	Misbehaves to get attention from adults.	0	1	2	
24.	Tries to do as you ask.	0	1	2	
25.	Plays with toys for 5 minutes or longer.	0	1	2	
26.	Hugs people with a squeeze or pat. (N: Physically unable)	0	1	2	N
27.	Has started doing something s/he had out grown (like use a pacifier).	0	1	2	
28.	Is afraid of certain animals. What animal(s)?:_____	0	1	2	
29.	Is afraid of certain things. What thing(s)?: _____	0	1	2	
30.	Is afraid of certain places, like stores, elevators, parks, or cars. What place(s)?: _____	0	1	2	
31.	Hangs on you or wants to be in your lap when with other people.	0	1	2	
32.	Rolls a ball back to you (or someone else). (N: Physically unable).	0	1	2	N
33.	Has less fun than other children.	0	1	2	
34.	Likes being cuddled, hugged or kissed by loved ones.	0	1	2	
35.	Is very loud. Shouts or screams a lot.	0	1	2	
36.	Reaches for you when you are not holding him/her. (N: Physically unable)	0	1	2	N
37.	Spits out food(s).	0	1	2	
38.	Is disobedient or defiant. For example, refuses to do as you ask.	0	1	2	
39.	Cries if doesn't get own way.	0	1	2	
40.	Looks for you (or other parent) when upset.	0	1	2	
41.	Goes from toy to toy faster than other children his/her age.	0	1	2	
42.	Keeps trying even when something is hard.	0	1	2	
43.	Is sneaky. Hides misbehavior.	0	1	2	
44.	Looks at picture books by self.	0	1	2	
45.	Helps with dressing. For example, puts arm in sleeve.	0	1	2	
46.	Cries or hangs onto you when you try to leave.	0	1	2	
47.	Needs to have things repeated because s/he is not paying attention.	0	1	2	
48.	Worries a lot or is very serious.	0	1	2	

0 = not true/rarely 1 = somewhat true/sometimes 2 = very true/often

Please choose the answer that best describes your child in the LAST MONTH:

49.	Feels sick when nervous or upset	0	1	2
50.	Pretends to do grown-up things, like shave.	0	1	2
51.	Is bothered by how some things feel on his/her skin. (For example, clothing seams, certain fabrics, etc.).	0	1	2
52.	Looks right at you when you say his/her name	0	1	2
53.	Does not react when hurt.	0	1	2
54.	Is easily startled	0	1	2
55.	Is affectionate with loved ones.	0	1	2
56.	Is well-behaved.	0	1	2
57.	Prefers you (or other parent) over other adults.	0	1	2
58.	Laughs easily or a lot.	0	1	2
59.	Is stubborn.	0	1	2
60.	Won't touch some objects because of how they feel.	0	1	2
61.	Is hard to soothe when upset.	0	1	2
62.	Runs away in public places.	0	1	2
63.	Sleeps through the night	0	1	2
64.	Often gets very upset.	0	1	2
65.	Gags or chokes on food	0	1	2
66.	Wants to do things for self.	0	1	2
67.	Points to ask for something.	0	1	2
68.	Points to show you something far away.	0	1	2
69.	Is bothered by being in motion. For example, swinging, spinning, being tossed in the air, or bouncing.	0	1	2
70.	Wakes up grouchy or in a bad mood.	0	1	2
71.	Has trouble falling asleep or staying asleep	0	1	2
72.	Tries to make you feel better when you're upset.	0	1	2
73.	Stays still while being changed, dressed or bathed.	0	1	2
74.	Has trouble calming down when upset.	0	1	2
75.	Demands a lot of attention.	0	1	2
76.	Sits for 5 minutes while you read a story	0	1	2
77.	Is worried or upset when someone is hurt.	0	1	2
78.	Tries to "make-up" after misbehaving.	0	1	2
79.	Must be held to go to sleep.	0	1	2
80.	Is easily upset by little things.	0	1	2

0 = not true/rarely 1 = somewhat true/sometimes 2 = very true/often

Please choose the answer that best describes your child in the LAST MONTH:

81.	Is impatient or easily frustrated	0	1	2	
82.	Is interested in other babies and children	0	1	2	
83.	Likes figuring things out, like stacking blocks	0	1	2	
84.	Can pay attention for a long time. (Not including TV)	0	1	2	
85.	Is affectionate with strangers	0	1	2	
86.	Is aware of other people's feelings	0	1	2	
87.	When upset, gets very still, freezes or doesn't move	0	1	2	
88.	Has trouble adjusting to changes	0	1	2	
89.	Tries to help when someone is hurt. For example, gives a toy	0	1	2	
90.	Is shy with new adults	0	1	2	
91.	Is able to wait for things s/he wants	0	1	2	
92.	Cries a lot	0	1	2	
93.	Gets "wound up" or silly around groups of people	0	1	2	
94.	Imitates playful sounds when you ask him/her to	0	1	2	
95.	Pretends that objects are something else. For example, uses banana as phone	0	1	2	
96.	Accepts new foods right away	0	1	2	
97.	Enjoys challenging activities	0	1	2	
98.	Hugs or feeds dolls or stuffed animals	0	1	2	
99.	Is a perfectionist	0	1	2	
100.	Imitates clapping or waving "bye-bye." (N: Physically unable)	0	1	2	N
101.	Is <u>not</u> afraid when should be	0	1	2	
102.	"Jokes" or gives you things to make you smile or laugh	0	1	2	
103.	Is irritable or grouchy	0	1	2	
104.	Pays careful attention when being taught something new	0	1	2	
105.	Looks unhappy or sad without any reason	0	1	2	
106.	Sleeps more than other children his/her age	0	1	2	
107.	Refuses to eat	0	1	2	
108.	Is curious about new things	0	1	2	
109.	Wakes up screaming and doesn't respond to you for a few minutes ("night terrors")	0	1	2	
110.	Is whiny or fussy when s/he is <u>not</u> tired	0	1	2	
111.	Feels bad about self	0	1	2	
112.	Is a good eater	0	1	2	

0 = not true/rarely **1 = somewhat true/sometimes** **2 = very true/often**

Please choose the answer that best describes your child in the LAST MONTH:

113. Is shy with new children.	0	1	2	
114. Is destructive. Breaks or ruins things on purpose.	0	1	2	
115. Seems to have no energy	0	1	2	
116. Gets angry or pouts.	0	1	2	
117. Wakes up from scary dreams or nightmares.	0	1	2	
118. Wants to sleep in someone else's room or bed. (N: Always shares a room or bed)	0	1	2	N
119. Has temper tantrums.	0	1	2	
120. Hits, bites or kicks you (or other parent).	0	1	2	
121. Is a picky eater.	0	1	2	
122. Smiles back at you from across a room.	0	1	2	
123. Seems withdrawn.	0	1	2	
124. Seems very unhappy, sad or depressed.	0	1	2	
125. Obeys when asked to stop being aggressive.	0	1	2	
126. Refuses to eat certain food(s) for 2 days or more.	0	1	2	
127. Purposely tries to hurt you (or other parent).	0	1	2	
128. Gets upset when asked to change activities.	0	1	2	

Section B:

Please circle the number in this box that best indicates the answer to the following question:

Has your child begun to combine words yet, such as "more juice" or "doggie bite?"

0: Not yet -> Please go to Section C on the next page.

1: Sometimes-> Please answer questions 1-5 below.

2: Often -> Please answer questions 1-5 below.

0 = not true/rarely **1 = somewhat true/sometimes** **2 = very true/often**

Please choose the answer that best describes your child in the LAST MONTH:

1. Repeats the last words of sentences or TV commercials.	0	1	2
2. Swears.	0	1	2
3. Takes a while to speak in unfamiliar situations.	0	1	2
4. Talks about other people's feelings (like "Mommy mad")	0	1	2
5. Talks about things that are strange, scary or disgusting.	0	1	2

Section C:
EXPERIENCES WITH OTHER YOUNG CHILDREN
In the last month, about how much time did your child spend with other young children each week (not including brothers and sisters)? ..... _____ hours
If your child did not have any contact with young children in the last month, please go to Section D on the next page.

0 = not true/rarely 1 = somewhat true/sometimes 2 = very true/often
Please choose the answer that best describes your child in the LAST MONTH:

1. Takes turns when playing with others.	0	1	2
2. "Tests" other children to see if they will get angry.	0	1	2
3. Asks for things nicely when playing with children.	0	1	2
4. Hits, shoves, kicks, or bites children (not including brother/sister).	0	1	2
5. Has at least one favorite friend (a child).	0	1	2
6. Picks on or bullies other children.	0	1	2
7. Plays well with other children.	0	1	2
8. Teases other children.	0	1	2
9. Plays "house" with other children.	0	1	2
10. Won't let other children play with his/her group.	0	1	2
11. Hurts other children on purpose.	0	1	2
12. Shares toys and other things.	0	1	2

Section D: The questions in the next section ask about feelings and behaviors that can be problems for young children. Some of the questions may be a bit hard to understand especially if you have not seen them in a child. Please do your best to answer them anyway.

0 = not true/rarely 1 = somewhat true/sometimes 2 = very true/often

Please choose the answer that best describes your child in the LAST MONTH:

1.	"Spaces out." Is totally unaware of what's happening around him/her.....	0	1	2
2.	Avoids physical contact.	0	1	2
3.	Does not make eye contact.	0	1	2
4.	Has a body tic or twitch s/he seems unable to control.	0	1	2
	For example, eyes, mouth, nose or legs twitch.	0	1	2
5.	Makes sounds s/he seems unable to control.	0	1	2
6.	Holds food in cheeks.....	0	1	2
7.	Hurts animals on purpose.....	0	1	2
8.	Is **very** worried about getting dirty.	0	1	2
9.	Needs things to be clean or neat.	0	1	2
10.	Plays games with other children in which they look at or touch each other's private parts.	0	1	2
11.	Plays with own sex parts often and for a long time.	0	1	2
12.	Pulls own hair out (e.g., eyelashes, eyebrows, head hair, etc.).....	0	1	2
13.	Without looking at you, puts your hand on objects, such as wind-up toys, to make them work.	0	1	2
14.	Worries about own body.....	0	1	2
15.	Puts things in a special order, over and over.	0	1	2
16.	Plays with own bowel movements ("poops").....	0	1	2
17.	Has bowel movements where s/he shouldn't, like on the floor.	0	1	2
18.	Urinates ("pees") where s/he shouldn't.	0	1	2
19.	Acts out the same pretend theme, over and over.	0	1	2
	Please describe: _____			
20.	Repeats a particular movement, over and over (like rocking, spinning, etc.).	0	1	2
	Please describe: _____			
21.	Repeats the same action or phrase, over and over.	0	1	2
	Please describe: _____			
22.	Has very strange habits.	0	1	2
	Please describe: _____			
23.	Eats or drinks things that are not edible, like paper or paint.	0	1	2
	Please describe: _____			
24.	Chews on things s/he shouldn't.	0	1	2
	Please describe: _____			

Section E:
Does your child spend time with any brothers or sisters (siblings) regularly?
0: NO → Please go to next section.
1: YES→ Please answer questions below.

0 = not true/rarely **1 = somewhat true/sometimes** **2 = very true/often**
Please choose the answer that best describes your child in the LAST MONTH:

1.	Acts bossy with sibling(s).	0	1	2
2.	Acts jealous of sibling(s).	0	1	2
3.	Enjoys playing with sibling(s).	0	1	2
4.	Is affectionate with sibling(s)	0	1	2
5.	Hits, shoves, kicks, or bites sibling(s)	0	1	2
6.	Is hit, shoved, kicked or bitten by sibling(s).	0	1	2
7.	Is teased or picked on by sibling(s)	0	1	2
8.	Shares with sibling(s)	0	1	2
9.	Teases or picks on sibling(s).	0	1	2

Section F: Now, we are interested in events that are sometimes stressful for children. Please indicate whether each of the events listed below has **EVER happened to your child in his/her WHOLE LIFE.** Also write in how old s/he was the last time it happened.

In your child's WHOLE LIFE, has s/he ever...

1. gotten a new baby brother or sister? ..... 0: No 1: Yes → child was _____months old
2. had a loved one die? ..... 0: No 1: Yes → child was _____months old
3. been bitten by a dog? ..... 0: No 1: Yes → child was _____months old
4. experienced the divorce or separation of his/her parents? ..... 0: No 1: Yes → child was _____months old
5. been in a car accident? ..... 0: No 1: Yes → child was _____months old
6. stayed in the hospital overnight? ..... (due to an illness) 0: No 1: Yes → child was _____months old
7. been separated from parent or guardian for 1 week or more? ..... 0: No 1: Yes → child was _____months old
8. seen violence in your neighborhood? ..... 0: No 1: Yes → child was _____months old
9. seen someone use a weapon to threaten or hurt a family member? ..... 0: No 1: Yes → child was _____months old
10. seen someone hit, push, or kick a family member? ..... 0: No 1: Yes → child was _____months old
11. seen or heard adult family members arguing very loudly or fighting? 0: No 1: Yes → child was _____months old
12. been hurt seriously? ..... 0: No 1: Yes → child was _____months old
    What was the injury? _____ (___)
13. had a medical operation? ..... 0: No 1: Yes → child was _____months old
    What type of surgery? _____ (___)
14. experienced any other upsetting event? ... 0: No 1: Yes → child was _____months old
    What was the event? _____ (___)

Did you answer "yes" to any of the questions above (1-14)?

0: NO → Please stop here.

1: YES → Please go to the box at the top of the next page.

15. At any time after the event(s) did you notice a **sudden or dramatic change in your child** that you believe was <u>not</u> just because s/he was getting older?
    0: NO → Please stop here.
    1: YES → Please answer 16-20 below.

16. After what event did you notice the change? _____ (_____)

17. Do you believe this event caused the change? 0: No 1: Yes 9: Not sure

18. How old was s/he when you first noticed the change? _____ months old

19. How long did this change in your child last?
    - ☐ still going on
    - ☐ less than 1 week
    - ☐ 1 or 2 weeks
    - ☐ 3 or 4 weeks
    - ☐ 1 or 2 months
    - ☐ over 2 months

20. Were any of the changes in your child's behavior present in the LAST 2 MONTHS?
    0: NO → Please stop here.
    1: YES → Please continue below.

Please check the box next to each behavior that you noticed in the LAST 2 MONTHS.

- ☐ more aggressive
- ☐ more irritable
- ☐ more tantrums
- ☐ more clingy
- ☐ more trouble separating from you
- ☐ repeats the same play activity more than before
- ☐ loss of motor abilities (For example, no longer claps or jumps, or seems more clumsy)
- ☐ more withdrawn
- ☐ more nightmares
- ☐ less happy
- ☐ more active
- ☐ more worried or anxious
- ☐ more bothered by upsetting memories
- ☐ less independent (For example, needs more help with dressing, eating or toiletting)
- ☐ more toiletting "accidents"
- ☐ more eating problems
- ☐ more sleep problems
- ☐ more jumpy/startles easily
- ☐ more often sad or unhappy
- ☐ repeats same words or stories over & over
- ☐ more fearful (For example, fears people, the dark, being alone, or fears other things)
- ☐ loss of language ability

YOUR OPINIONS

You have just finished our questionnaire about social and emotional development. This is a relatively new questionnaire that we are always trying to improve. Your opinions are extremely valuable to this process.

1. Please check each word or phrase that describes how you felt while completing this survey:

❑ Happy	❑ Sad	❑ Worried about *this child*
❑ Interested	❑ Bored	
❑ Calm	❑ Upset	❑ Worried about a *different child*
❑ Thoughtful	❑ Anxious	
❑ Proud of my child	❑ Tired	
❑ Pleased with myself as parent	❑ Irritated	

2. Did you think the survey was too long? ❑ No ❑ Somewhat ❑ Yes

3. Would you tell a friend to fill out the ITSEA if they were asked ❑ No ❑ Maybe ❑ Yes

4. Were the questions hard or easy to understand? Very hard to understand 1----2----3----4----5 Very easy to understand

We welcome any comments you have about the questionnaire you just answered:

_____

_____

_____

CHILD CARE

1. How often does someone else care for your child (not including child's other parent)?
   A. Never B. 1 to 2 times a month C. About once a week D. Several times a week E. Almost every day

2. What types of child care do you use? (Circle all that you use).
   A. None
   B. Baby-sitter
   C. Child Care Center
   D. Someone comes into your home (baby-sitter, nanny, relative, etc.)
   E. Non-relative cares for in their home
   F Relative cares for in their home
   G. Other (describe): _____

3. How many hours per week you you use child care (on average)? _____ hours per week.

4. Which of the following programs does your child attend? (circle all that apply)
   A. Preschool
   B. Visits with friend
   C Play group
   D. Other activity with children (describe): _____
   E. Child care with other children

5. How often does s/he spend time with other children (not siblings)?
   ___ times a week or ___ times a month

Demographic Form

We would like some background information about yourself and your family. Remember, this information is *strictly confidential. Please do not write any names on these forms!* Some of the questions are a bit personal. If you are uncomfortable answering a question, you may leave it blank.

1. Child's birthdate: ___/___/___
   mo. day year

2. Child's age: _____months

3. Child's gender: ☐ Girl ☐ Boy

4. Child's ethnicity
   A. NZ European/ Pakeha
   B. NZ Maori
   C. Samoan
   D. Other Pacific Island
   E. Asian
   F. Other_____

5. Your birthdate: ___/___/___

6. Relationship to child:
   A. Mother (biological)
   B. Step-mother
   C. Adoptive mother
   D. Grandmother
   Other (describe):_____
   E. Father (biological)
   F. Step-father
   G. Adoptive father
   H. Grandfather

7. Marital Status:
   A. Married/Remarried
   B. Defacto relationship
   C. Separated
   D. Divorced
   E. Single
   F. Widowed

8. Your education
   A. ___th grade
   B. High School-Grade___
   C. Trade qualification
   D. Tertiary qualification
   E. Some university
   F. University degree

9. Spouses/partner's education
   A. ___th grade
   B. High School-Grade___
   C. Trade qualification
   D. Tertiary qualification
   E. Some university
   F. University degree

10. Do you work..... Full-time Part-time Not Working Student
    Job:_____ Type of company:_____

11. Spouses/partner works Full-time Part-time Not Working Student
    Job:_____ Type of company:_____

12. Household income (before taxes): under 30,000__ under 40,000__ under 60,000__
    under 80,000__ under 100,000__ over 100,000__

13. How hard is it to make ends meet on this income? Not at all 0—1—2—3—4 Very hard

14. Including yourself, how many people live in your home? _____
    Please list each person's relationship to this child & age:

Relationship to child:	*Age:*	*Relationship to child:*	*Age:*
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

15. Including yourself, how many adults does your child *feel close to and trust?* ____